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FINAL SAMPLING AND ANALYSIS PLAN SOIL DELINEATION AND CHARACTERIZATION INVESTIGATION FOR SOLID WASTE MANAGEMENT UNIT 16 CAST HIGH EXPLOSIVES FILL BUILDING 146 INCINERATORNSA CRANE IN

8/1/2011

TETRA TECH NUS

Final
Sampling and Analysis Plan
(Field Sampling Plan and
Quality Assurance Project Plan)

Soil Delineation and Characterization Investigation
SWMU 16 - Cast High Explosive Fill/ Building 146 Incinerator

Naval Support Activity Crane
Crane, Indiana

Naval Facilities Engineering Command Midwest

Naval Facilities Engineering Command Midwest

Contract Number N62470-08-D-1001
Contract Task Order F277

August 2011

Title and Approval Page

(UFP-QAPP Manual Section 2.1)

FINAL
SAMPLING AND ANALYSIS PLAN
(Field Sampling Plan and Quality Assurance Project Plan)
August 2011

SOIL DELINEATION AND CHARACTERIZATION INVESTIGATION

SWMU 16 – CAST HIGH EXPLOSIVE FILL/BUILDING 146 INCINERATOR
NAVAL SUPPORT ACTIVITY CRANE
CRANE, INDIANA

Prepared for:
Naval Facilities Engineering Command Midwest
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Comprehensive Long-Term Environmental Action Navy
Contract No. N62470-08-D-1001
Contract Task Order F277

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Title and Approval Page

(UFP-QAPP Manual Section 2.1)

DRAFT
SAMPLING AND ANALYSIS PLAN
(Field Sampling Plan and Quality Assurance Project Plan)
May 2011

SOIL DELINEATION AND CHARACTERIZATION INVESTIGATION

SWMU 16 – CAST HIGH EXPLOSIVE FILL/BUILDING 146 INCINERATOR
NAVAL SUPPORT ACTIVITY CRANE
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EXECUTIVE SUMMARY

Tetra Tech NUS, Inc. (Tetra Tech) has prepared this Sampling and Analysis Plan (SAP) that encompasses Field Sampling Plan (FSP) and Quality Assurance Project Plan (QAPP) requirements for an investigation to provide data necessary to refine estimates of contaminated soil for a remedial design at Solid Waste Management Unit (SWMU) 16 –Cast High Explosives Fill/Building 146 Incinerator at Naval Support Activity (NSA) Crane, Crane, Indiana under Contract Task Order (CTO) F277, Contract N62470-08-D-1001, Comprehensive Long-Term Environmental Action Navy (CLEAN).

The SAP contained herein was generated for and complies with applicable United States (U.S.) Department of the Navy (Navy), U. S. Environmental Protection Agency (USEPA) Region 5, and Indiana Department of Environmental Management (IDEM) requirements, regulations, guidance, and technical standards. This includes the Department of Defense (DoD), Department of Energy (DOE), and USEPA Intergovernmental Data Quality Task Force (IDQTF) environmental requirements regarding federal facilities

This SAP outlines the organization, project management, objectives, planned activities, measurement, data acquisition, assessment, oversight, and data review procedures associated with the planned investigations at SWMU 16. Protocols for sample collection, handling and storage, chain-of-custody, laboratory and field analyses, data validation, and reporting are also addressed in this SAP.

SWMU 16, which is approximately 16 acres in size, is located in the north-central portion of NSA Crane. Figure 4-1 shows the general location of NSA Crane in southern Indiana, and the location of SWMU 16 within NSA Crane. Buildings and gravel parking lots cover most of the northern portion of SWMU 16 in the vicinity of Building 146, and mostly grassy and wooded areas are located south and east of Building 146 (Figure 4-2). Building 146, which has an area of approximately two-thirds acre, was an explosives fill and pressure washout facility and included a trichloroethene (TCE) degreaser, which discharged to sumps located outside of Building 146. Prior to 1978, outfalls from the sumps, which are located north, east, and west of Building 146, discharged to swales that ultimately discharged to Boggs Creek via Turkey Creek. The degreaser has been removed and the drain lines from Building 146 have been plugged. Three oil-fired, rotary kiln incinerators, with fuel storage tanks were located on the south end of Building 146. These incinerators were used for the destruction of the explosive constituent of small munitions items and components. Ashes from the incinerator were stored in a pile, which was located near the incinerators. The incinerators were closed in the early 1990s, and the waste ash piles were removed along with some obviously contaminated soil.

The Navy has determined that an interim measures action will be conducted to reduce the risks, which were identified in the RFI Efficient implementation of the interim measure requires a more precise delineation of the extent of soils contamination. The sampling and analytical program, which is necessary to delineate the soils contamination, is described in this SAP. The results will be utilized in the SWMU 16 Interim Measures Work Plan (IMWP).

The sampling strategy for SWMU 16 is to implement soil contamination delineation sampling for the Interim Measures phase of the project at two discrete areas (TCE Contamination Area and Metals Contamination Area) in order to provide for prescriptive sampling prior to soil excavation. The IMWP will include the horizontal and vertical extent of soil excavations needed to meet media cleanup standards (MCSs). No confirmation sampling will be required.

In addition, a UST was identified after the completion of Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) field activities. Therefore, it was not investigated during the RFI, and no information is available regarding the occurrence of releases or soil quality near the tank. Soil samples will be collected in the vicinity of the UST to determine the presence or absence of contamination associated with the tank, and if present, the extent of target analyte concentrations greater than applicable MCSs. All soils with target analyte concentrations greater than the corresponding MCS will be included for excavation in the IMWP.

Investigation procedures will comply with site-specific field Standard Operating Procedures (SOPs), included in Appendix A, and laboratory analytical procedures will comply with laboratory SOPs. The field work and sampling are scheduled to begin in August 2011.

The field activities under this SAP will be conducted in accordance with the site-specific health and safety plan to be prepared for these activities.

SAP Worksheets **Page No.**

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ACRONYMS AND ABBREVIATIONS

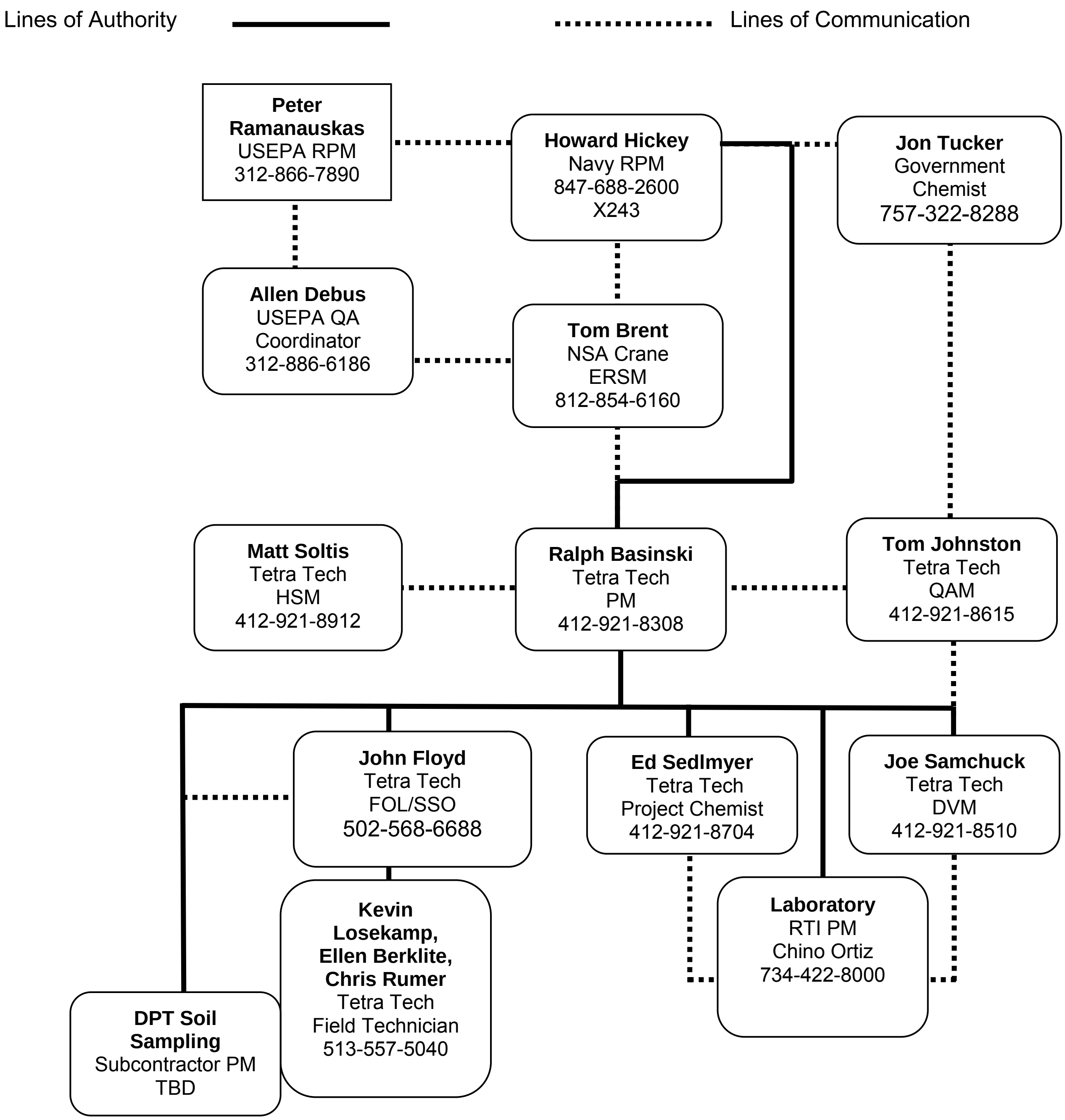
1,1,2-TCA	1,1,2-Trichloroethane
°C	Degrees Celsius
%R	Percent Recovery
%RSD	Percent Relative Standard Deviation
bgs	Below Ground Surface
CA	Corrective Action
CAS	Chemical Abstracts Service
CFR	Code of Federal Regulations
cis-1,2-DCE	cis-1,2-Dichloroethene
CLEAN	Comprehensive Long-Term Environmental Action Navy
CMD	Corrective Measure Design
CMP	Corrective Measure Proposal
CMS	Corrective Measure Study
COC	Chemical of Concern
CTO	Contract Task Order
DAF	Dilution Attenuation Factor
DL	Detection Limit
DoD	Department of Defense
DOE	Department of Energy
DPT	Direct-Push Technology
DQI	Data Quality Indicator
DQO	Data Quality Objective
DRO	Diesel Range Organic
DVM	Data Validation Manager
Eco SSL	Site-Specific Ecological Soil Screening Level
EDD	Electronic Data Deliverable
ELAP	Environmental Laboratory Accreditation Program
ERA	Ecological Risk Assessment
ERSM	Environmental Restoration Site Manager
FID	Flame Ionization Detector
FOL	Field Operations Leader
FSP	Field Sampling Plan
FTMR	Field Task Modification Request
g	Gram
GC/MS	Gas Chromatography / Mass Spectrometry

GPS	Global Positioning System
HASP	Health and Safety Plan
HSM	Health and Safety Manager
ICP/MS	Inductively Coupled Plasma/Mass Spectroscopy
IDEM	Indiana Department of Environmental Management
IDQTF	Intergovernmental Data Quality Task Force
IDW	Investigation-Derived Waste
IMWP	Interim Measures Work Plan
IS	Internal Standard
IUPPS	Indiana Underground Plant Protection Services
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
LOD	Limit of Detection
LOQ	Limit of Quantitation
LTM	Long Term Monitoring
LUC	Land Use Control
MCL-SSL	Maximum Contaminant Level-Based Migration-to-Groundwater Soil Screening Level
MCS	Media Cleanup Standard
mg/kg	Milligram per Kilogram
mL	Milliliter
MPC	Measurement Performance Criterion
MS	Matrix Spike
MSD	Matrix Spike Duplicate
NA	Not Applicable
NAD	North American Datum
NAVFAC	Naval Facilities Engineering Command
Navy	U. S. Department of the Navy
NEDD	NIRIS Electronic Data Deliverable
NFA	No Further Action
NIRIS	Naval Installation Restoration Information Solution
NSA	Naval Support Activity
OSHA	Occupational Safety and Health Administration
oz	Ounce
PID	Photoionization Detector
PM	Project Manager
PPE	Personal Protective Equipment
PQLG	Project Quantitation Limit Goal

QA	Quality Assurance
QAM	Quality Assurance Manager
QAPP	Quality Assurance Project Plan
QC	Quality Control
QSM	Quality Systems Manual
RBSSL	Risk-Based Migration-to-Groundwater Soil Screening Level
RCRA	Resource Conservation and Recovery Act
R-DCL	Residential Default Closure Level
RFI	Resource Conservation and Recovery Act Facility Investigation
RPD	Relative Percent Difference
RPM	Remedial Project Manager
RT	Retention Time
RTI	RTI Laboratories, Inc.
SAP	Sampling and Analysis Plan
SOP	Standard Operating Procedure
SPCS	State Plan Coordinate System
SSL	Soil Screening Level
SSO	Site Safety Officer
SWMU	Solid Waste Management Unit
TBD	To Be Determined
TCE	Trichloroethene
Tetra Tech	Tetra Tech NUS, Inc.
TPH	Total Petroleum Hydrocarbons
trans-1,2-DCE	trans-1,2-Dichloroethene
UFP-SAP	Uniform Federal Policy for Sampling Analysis Plan
UFP-QAPP	Uniform Federal Policy for Quality Assurance Project Plan
U.S.	United States
USEPA	United States Environmental Protection Agency
UST	Underground Storage Tank
VOC	Volatile Organic Compound

1.0 -- Project Organizational Chart

(UFP-QAPP Manual Section 2.4.1 – Worksheet #5)



DVM - Data Validation Manager
ERSM - Environmental Restoration Site Manager
FOL - Field Operation Leader
HSM - Health and Safety Manager
PM - Project Manager
QAM - Quality Assurance Manager
RPM - Remedial Project Manager
TBD - To Be Determined
USEPA - United States Environmental Protection Agency

2.0 -- Communication Pathways

(UFP-QAPP Manual Section 2.4.2 – Worksheet #6) The communication pathways for the Sampling and Analysis Plan (SAP) are shown below.

Communication Drivers	Responsible Entity	Name	Phone Number	Procedure (Timing, Pathway To/From, etc.)
Regulatory Agency Interface	USEPA RPM U.S. Department of the Navy (Navy) RPM	Peter Ramanauskas Howard Hickey	312-866-7890 847-688-2600 x243	The Navy RPM will contact the regulatory agency via phone and/or e-mail within 24 hours of recognizing the issue whenever issues arise.
Field Progress Reports	Tetra Tech NUS, Inc. (Tetra Tech) FOL Tetra Tech PM	John Floyd Ralph Basinski	502-568-6688 412-921-8308	The Tetra Tech FOL will contact the Tetra Tech PM on a daily basis via phone, and every 1-2 days summarizing progress via e-mail.
Gaining site access	Tetra Tech FOL Naval Support Activity (NSA) Crane ERSM	John Floyd Tom Brent	502-568-6688 812-854-6160	The Tetra Tech FOL shall contact the NSA Crane ERSM verbally or via e-mail at least 3days prior to commencement of field work to arrange for access to the site for all field personnel.
Obtaining utility clearances	Tetra Tech FOL	John Floyd	502-568-6688	The Tetra Tech FOL shall contact the Indiana Underground Plant Protection Services (IUPPS) verbally or via e-mail at least 3 days prior to commencement of field work to complete a utility clearance ticket for the areas under investigation.

Communication Drivers	Responsible Entity	Name	Phone Number	Procedure (Timing, Pathway To/From, etc.)
Stop Work due to Safety Issues	Tetra Tech FOL/Site Safety Officer (SSO) Tetra Tech PM Tetra Tech HSM Navy RPM NSA Crane ERSM	John Floyd Ralph Basinski Matt Soltis Howard Hickey Tom Brent	502-568-6688412-921-8308 412-921-8612 847-688-2600 x243 812-854-6160	If Tetra Tech is the responsible party for a stop work command, the Tetra Tech FOL will inform onsite personnel, subcontractor(s), the Naval Support Area (NSA) Crane ERSM, and the identified Project Team members within 1 hour (verbally or by e-mail). If a subcontractor is the responsible party, the subcontractor PM must inform the Tetra Tech FOL within 15 minutes, and the Tetra Tech FOL will then follow the procedure listed above.
Sampling and Analyses Plan (SAP) Changes prior to Field/ Laboratory work	Tetra Tech FOL/SSO Tetra Tech PM Navy RPM NSA Crane ERSM	John Floyd Ralph Basinski Howard Hickey Tom Brent	502-568-6688412-921-8308 847-688-2600 x243 812-854-6160	The Tetra Tech PM will document the proposed changes via a Field Task Modification Request (FTMR) form within 5 days and send the Navy RPM a concurrence letter within 7 days of identifying the need for change if necessary. SAP amendments will be submitted by the Tetra Tech PM to the Navy RPM and NSA Crane ERSM for review and approval. The Tetra Tech PM will send scope changes to the Project Team via e-mail within 1 business day.

Communication Drivers	Responsible Entity	Name	Phone Number	Procedure (Timing, Pathway To/From, etc.)
SAP Changes in the Field	Tetra Tech FOL/SSO Tetra Tech PM Navy RPM NSA Crane ERSM	John Floyd Ralph Basinski Howard Hickey Tom Brent	502-568-6688412-921-8308 847-688-2600 x243 812-854-6160	The Tetra Tech FOL will verbally inform the Tetra Tech PM on the day that the issue is discovered. The Tetra Tech PM will inform the Navy RPM and the NSA Crane ERSM (verbally or via e-mail) within 1 business day of discovery. The Navy RPM will issue a scope change (verbally or via e-mail), if warranted. The scope change is to be implemented before further work is executed. The Tetra Tech PM will document the change via an FTMR form within 2 days of identifying the need for change and will obtain required approvals within 5 days of initiating the form.
Field Corrective Actions	Tetra Tech PM Tetra Tech QAM Navy RPM	Ralph Basinski Tom Johnston Howard Hickey	412-921-8308 412-921-8615 847-688-2600 x243	The Tetra Tech QAM will notify the Tetra Tech PM verbally or by e-mail within one business day that the corrective action has been completed. The Tetra Tech PM will then notify the Navy RPM (verbally or by e-mail) within 1 business day

Communication Drivers	Responsible Entity	Name	Phone Number	Procedure (Timing, Pathway To/From, etc.)
Analytical Corrective Actions	RTI Laboratories, Inc. (RTI) Laboratory PM Tetra Tech Project Chemist Tetra Tech DVM Tetra Tech PM Navy RPM	Chino Ortiz Ed Sedlmyer Joseph Samchuck Ralph Basinski Howard Hickey	734-422-8000 412-921-8704 412-921-8510 412-921-8308 847-688-2600 x243	The Laboratory PM will notify (verbally or via e-mail) the Tetra Tech Project Chemist within 1 business day of when an issue related to laboratory data is discovered. The Tetra Tech Project Chemist will notify (verbally or via e-mail) the DVM and the Tetra Tech PM within 1 business day. Tetra Tech DVM or Project Chemist notifies Tetra Tech PM verbally or via e-mail within 48 hrs of validation completion that a non-routine and significant laboratory quality deficiency has been detected that could affect this project and/or other projects. The Tetra Tech PM verbally advises the – Navy RPM within 24 hours of notification from the Tetra Tech Project Chemist or DVM. The Navy RPM takes corrective action appropriate for the identified deficiency. Examples of significant laboratory deficiencies include data reported that has a corresponding failed tune or initial calibration verification. Corrective actions may include a consult with the Navy Chemist.

3.0 -- Project Planning Session Participants Sheet

(UFP-QAPP Manual Section 2.5.1 – Worksheet #9)

<table>
<tr><td colspan="3">Project Name: Soil Contamination Study

Projected Date(s) of Sampling:
Spring 2011

Project Manager: Ralph Basinski</td><td colspan="3">Site Name: Solid Waste Management Unit (SWMU) 16 – Cast High Explosive Fill/Building 146 Incinerator

Site Location: Crane, Indiana</td></tr>
<tr><td colspan="6">Date of Session: April 20, 2011
Scoping Session Purpose: Data Quality Objective (DQO) Scoping Meeting</td></tr>
<tr><th>Name</th><th>Title</th><th>Affiliation</th><th>Phone #</th><th>E-Mail Address</th><th>Project Role</th></tr>
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</table>

Background: The Navy has determined that soil remediation (excavation) must be conducted at SWMU 16 to remove soils contaminated above Media Cleanup Standards (MCSs). Sources for MCS values are identified in Section 5.2 of this SAP. The boundary between contaminated and non-contaminated areas needs to be more precisely defined to minimize excavation volume and costs. The Navy has directed Tetra Tech to develop a sampling and analytical program to collect the data required to refine the contaminated and non-contaminated soil boundaries in a single field event.

Comments/Decisions: Discussed SWMU 16 historical use and available data. Discussed the steps for implementing soil delineation sampling for the Corrective Measure Design (CMD), which will be conducted as an interim measure, in accordance with the Navy's Uniform Federal Policy-Sampling and Analyses Plan Tier II SAP format.

Action Items: Tetra Tech assigned the task to prepare the draft Tier II SAP.

Consensus Decisions: The meeting participants developed the overall strategy for the soil delineation sampling to facilitate a cost-effective soil removal remedial action. Consensus decisions included the following:

- Surface and subsurface soil sampling will be conducted to refine the delineation of the areas of soil impacted with trichloroethene (TCE), and surface soil sampling only will be conducted to refine the delineation of the areas of soil impacted with metals which were generally identified during the Resource Conservation and Recovery Act Facility Investigation (RFI) at concentrations above MCSs."

- Surface and subsurface soil samples will be conducted to determine the presence/absence of contamination in the area of the suspected underground storage tank (UST), and if present, the extent of contamination above an MCS.

- Surface soil samples will be collected from 0 to 2 feet below ground surface (bgs) in select areas identified based on RFI data in the TCE Contamination Area.

- Surface soil samples only will be collected in the Metals Contamination Area.

- For the TCE Contamination Area, subsurface soil samples will be collected from 2 to 6 feet bgs and from the 2- foot interval above bedrock (expected to be approximately 6 to 8 feet bgs in the area of sampling).

- Surface and subsurface soil samples will be collected in the area of the UST to determine if there are any target analytes that may be associated with the UST at concentrations above MCSs.

4.0 -- Conceptual Site Model

(UFP-QAPP Manual Section 2.5.2 – Worksheet #10)

This worksheet presents general background information about SWMU 16 – Cast High Explosives Fill/Building 146 Incinerator (Site).

4.1 SITE DESCRIPTION

SWMU 16, which is approximately 16 acres in size, is located in the north-central portion of NSA Crane. Figure 4-1 shows the general location of NSA Crane in southern Indiana, and the location of SWMU 16 within NSA Crane.

Buildings and gravel parking lots cover most of the northern portion of SWMU 16 in the vicinity of Building 146, and mostly grassy and wooded areas are located south and east of Building 146 (Figure 4-2). Building 146, which has an area of approximately two-thirds acre, was an explosives fill and pressure washout facility and included a TCE degreaser, which discharged to sumps located outside of Building 146. Explosives were washed out of containers such as bomb casings, with water and the washout materials were directed to sumps. Prior to 1978, outfalls from the sumps, which are located east, and west of Building 146 discharged to swales that ultimately discharged to Boggs Creek via Turkey Creek. The degreaser has been removed and the drain lines from Building 146 have been plugged to prevent fluid flow through the pipes. Three oil-fired, rotary kiln incinerators, with fuel storage tanks were located on the south end of Building 146. These incinerators were used for the thermal destruction of the explosives material from small munitions items and components. Ashes from the incinerator were stored in a pile which was located directly south of the incinerators. The incinerators were closed in the early 1990s, and the waste ash piles were removed along with contaminated soil.

4.2 SUMMARY OF RFI RESULTS

An RFI was conducted at NSA Crane SWMU 16 in 2003 and 2004 (Tetra Tech, 2011a). The RFI included the investigation of soil, sediment and groundwater quality.

The results of the RFI indicated that TCE contamination is present in the soil beneath Building 146 and extends from the building approximately 100 feet, primarily toward the west. The source of TCE is suspected to be sumps and associated piping leading from floor drains in Building 146. TCE was identified as a chemical of concern (COC) for site groundwater in the RFI, based on human health residential standards.

In addition, metals contamination was identified in surface soil south of Building 146, and is most likely associated with past incinerator operations. The contamination is present where the waste ash piles were formerly located, and in an adjacent area where contaminated ashes were deposited from runoff from the piles. The COCs that were identified in the ecological risk assessment (ERA) for soil invertebrates, invertivorous birds, and terrestrial plants receptors were antimony, copper, lead, and zinc, which are constituents of shell casings and bullets.

The RFI recommended that a Corrective Measures Study (CMS) be conducted to evaluate remedial options for the following media.

- Groundwater to address human health risks associated with TCE and metals
- Surface soils to address ecological risks associated with metals.

4.3 SUMMARY OF PROPOSED INTERIM MEASURES

The Navy has determined that an interim measures action will be conducted to reduce the risks which were identified in the RFI. Efficient implementation of the interim measure requires a more precise delineation of the extent of soils contamination. The sampling and analytical program, which is necessary to delineate the soils contamination, is described in this SAP. The results will be utilized in the SWMU 16 Interim Measures Work Plan (IMWP).

The Navy has determined that the following interim measures will be conducted:

- Removal of chlorinated solvent contaminated soils that may be serving as a source to groundwater,
- Removal of metals contaminated soils which present unacceptable ecological risk,
- Removal of sumps, and
- Removal of a UST and any adjacent contaminated soils.

The MCS for VOCs in soils, including TCE and its degradation products, are soil criteria established for protection of groundwater. These contaminants in soil are serving as an ongoing source of groundwater contamination. Figure 4-3 presents the concentrations of TCE in the surface and subsurface soils at SWMU 16 that are in exceedance of the MCS for TCE. Figure 4-4 shows the boundary between the contaminated and non-contaminated soils, and the current estimated extent of TCE soil contamination excavation.

The screening criteria used to identify the metals COCs (i.e., antimony, copper, lead and zinc) during the RFI were not appropriate for use as the MCS because they were developed using conservative exposure assumptions and do not consider site-specific factors. Toxicity/bioaccumulation testing was conducted to determine site-specific MCSs for protection of ecological receptors exposed to surface soils. The testing was conducted in accordance with a UFP-SAP (Tetra Tech, 2010). The results of the toxicity/bioaccumulation testing were presented in the Draft Final Technical Memorandum, Ecological Media Cleanup Goals, Surface Soil, SWMU 16 (Tetra Tech, 2011c). The site-specific MCS and RFI data were used to determine the extent of metals contaminated soil. Figures 4-5 through 4-8 show the concentrations of these metals in soils of this area at concentrations above MCS. Figure 4-9 presents the estimated extent of known contamination for all four metals, and the estimated maximum extent of all metals contamination in the soil.

5.0 -- Project Quality Objectives/Systematic Planning Process Statements

(UFP-QAPP Manual Section 2.6.1 – Worksheet #11)

5.1 PROBLEM STATEMENT

The extents of antimony, copper, lead, zinc, and TCE contamination in soil at two separate areas of SWMU 16 (near Building 146 and the metals contamination area) were delineated to support human health and ERAs. The human health risk assessment identified unacceptable levels of health risk for residential human receptors exposed to TCE- and metals-contaminated groundwater. The ERA identified unacceptable levels of risk for ecological receptors (i.e., soil invertebrates, invertivorous birds, and terrestrial plants) exposed to surface soil contaminated with antimony, copper, lead, and zinc. A remedy has been selected to reduce these risks to acceptable levels. The selected remedy comprises soil excavation to remove contaminated soil that serves as a groundwater contaminant source, groundwater monitoring to verify continued reduction of groundwater contaminant levels, and LUCs to prevent unacceptable human exposures.

The Navy and USEPA Region 5 agreed to incorporate a prescriptive soil remediation into the Corrective Measures Design (CMD), which will be implemented as an interim measure. In this remedy, the horizontal and vertical extent of soil contamination must be delineated sufficiently to support soil excavations in a way that minimizes the cost of soil excavation and disposal, but ensures removal of all soil with contaminant concentrations greater than established MCSs. This approach alleviates the need for confirmation sampling following remedy implementation because the extent of contamination is well defined.

The boundary of the contaminated soil (see Figures 4-4 and 4-9) is only known with a relatively coarse degree of spatial resolution that was sufficient for the risk assessments. Consequently, excavation from the most contaminated locations to the nearest locations at which contaminant concentrations are less than MCSs, would cause more soil to be excavated than is probably necessary to attain MCS concentrations across the Site and result in unnecessary expenditure for the Navy. Therefore, the Project Team must collect data to delineate the SWMU 16 soil contamination with a spatial resolution that supports a "no further action" (NFA) recommendation for soil once the contaminated soils are removed. In addition, the data collection must be accomplished in a single field event.

Also, because the SWMU 16 UST and surrounding soil were not investigated during the RFI, no information is available regarding the occurrence of contaminant releases from the UST. Contaminants could have included chlorinated and non-chlorinated VOCs, fuel oils, and lead (from leaded gasoline). Data must be collected near the UST to determine the presence or absence of soil contamination associated with the tank, and if present, the extent of contaminant concentrations greater than the applicable MCSs. The Project Team must, however, attempt to collect enough data to delineate contamination if it is present, thus potentially limiting additional data collection prior to excavation.

5.2 DATA NEEDS

Data that are required to resolve the problem described in Section 5.1 are as follows:

- Target Analyte Concentrations in soil. The list of target analytes varies with area of contamination. Refer to Section 5.3 for area-specific identification of target analytes. These data (both previously collected and new data) must be obtained using laboratory analyses of soil. A complete list of target analytes is also presented in Worksheet No. 9.0.

- Media Cleanup Standards. The chemical-specific values for the TCE Contamination Area and the UST Area are the USEPA groundwater protection Maximum Contaminant Level (MCL)-based values at a dilution attenuation factor (DAF) of 20 or, if these values are unavailable, the USEPA groundwater protection risk-based values at a DAF of 20. If neither of these is available for a specific compound, the MCS is the Indiana Department of Environmental Management (IDEM) Residential Closure Levels for Soil migration to groundwater standards. The chemical-specific values for the Metals Contamination Area are the site-specific ecological risk-based values derived from the toxicity/bioaccumulation testing conducted by Tetra Tech (Tetra Tech, 2011c). Details are provided on Worksheet No. 9.0.

Note: The DAF of 20 was chosen because the US EPA User Guide specifies that the screening values which are established at a DAF of 1 are not to be used as MCSs. MCSs, which are established at a DAF of 20 are similar to soil groundwater protection values established by IDEM.

- Global positioning system (GPS) coordinates (sub-meter accuracy) of previous and new data collection points in soil. The previous data locations are required to serve as points of reference for new data collection points. Data collection point coordinates must be documented in the State Plane Coordinate System (SPCS) North American Datum (NAD) 1983 Indiana West (feet).

- Depths of soil intervals to be investigated. The depth of the soil interval investigated must be obtained in accordance with Standard Operating Procedure (SOP)-05.

- Quality Control Sample Data. It is necessary to use cooler temperature blanks in coolers containing samples scheduled for all laboratory analyses except the metals. Field duplicate samples will be collected at a frequency of one duplicate sample for every 20 environmental samples. Equipment rinsate blanks are not needed because the Navy accepts the liability of accidentally contaminating a sample such that its concentration appears to exceed an MCS, when it really does not exceed the MCS.

- Analytical data reported by the laboratory use the following reporting conventions: All results below the Detection Limit (DL) will be considered nondetects. Positive results reported at concentrations between the DL and LOQ will be reported with a “J” qualifier; and analytes not found (not detected) in a sample will be reported as the Limit of Detection (LOD) with a "U" qualifier.

5.3 STUDY BOUNDARIES

Two populations of soil are of interest for each of the areas identified to have contaminant concentrations greater than MCSs. One population is the soil contaminated as a result of past site operations. The other population is soil not contaminated by site operations that helps to delineate the extent of site-related contamination. The populations of interest are subdivided into surface soil (generally 0 to 2 ft bgs) and subsurface soil (2 ft bgs to the top of bedrock). VOC contamination is not expected to be prevalent in the top 6-inches of soil; therefore, the surface soil interval for investigation of VOCs is 0.5 to 2 feet bgs.

Figures 4-4 and 4-9 identify the “contaminated” (i.e., >MCS) and “clean” (i.e., ≤ MCS) soils boundaries, based on RFI data for TCE and metals of concern, respectively. Previous delineation of contamination shows that soil contamination is generally limited to a depth of 8 feet or less, and 8 feet bgs is the maximum planned excavation depth. Bedrock is within approximately 8 feet of ground surface with an average depth of approximately 5 feet bgs in the planned area of excavation. Excavation of bedrock is not planned. Groundwater at SWMU 16 is present within a bedrock aquifer located more than 20 feet bgs; therefore, excavations are not expected to encounter groundwater. The shallow bedrock surface represents the greatest vertical extent of possible soil contamination.

Data collection is limited to a single field event.

The areas to be investigated, and the associated target analytes, are as follows:

- TCE Contamination Area (near Building 146): TCE and 1,1,2-trichloroethane (1,1,2-TCA), and the TCE degradation products cis- and trans-1,2-dichloroethene (DCE) and vinyl chloride, concentrations in surface and subsurface soil. Hereafter, this analyte list will be referred to as “TCE Contamination Area VOCs”.

- Metals Contamination Area: antimony, copper, lead, and zinc concentrations in surface soil only.

- UST Area: lead, VOCs (see Worksheet No. 9.0) and Total Petroleum Hydrocarbons (TPH) Diesel Range Organics (DRO) and Gasoline Range Organics (GRO) concentrations in surface and subsurface soil. Hereafter, the VOC list will be referred to as "UST Area VOCs".

5.4 ANALYTIC APPROACH

To resolve the problem statement presented in Worksheet No. 5.1 for the TCE and metal contamination areas, the following decision rule will be used:

<u>TCE and Metals Contamination Area Decision Rule</u>
If all data have been collected as planned (See Tables No. 8-1 and No. 8-3) and contamination has been delineated to below the MCS, with no significant quality deficiencies, consider the delineation of soil contamination to be complete and document this in the project report; otherwise, convene the Project Team to determine the appropriate course of action. The Project Team will consider during this evaluation whether the inability to collect data was a result of site conditions (e.g., encountering refusal prior to reaching the targeted maximum depth) or factors that indicate a need to more completely delineate contamination, either prior to, or in conjunction with, the planned excavation.

Note: Because of the high sampling density anticipated, the need for additional data collection is expected to be very low unless it is due to data quality deficiencies or a decision by the Navy RPM to reduce excavation costs further.

<u>UST Area Decision Rule</u>
To determine whether soil contamination is present at the UST Area, the following decision rule will be applied to the data obtained in this investigation:

If all data have been collected as planned (See Tables No. 8-1 and No. 8-3) and contamination has been delineated to below the MCS, with no significant quality deficiencies, consider the delineation of soil contamination to be complete and document this in the project report; otherwise, convene the Project Team to determine the appropriate course of action. If the measured concentration of any UST Area target analyte in any soil sample for the scheduled sampling locations in the UST Area exceeds its MCS, and contamination has been delineated then calculate the volume of soil to be excavated; otherwise recommend no soil excavation for the UST Area.

5.5 PERFORMANCE CRITERIA

The only performance criterion applicable to this project is a need to collect all planned data with no significant quality deficiencies. If this is achieved, the data collected will be considered sufficient to support the planned remediation. To evaluate data quality, the processes and criteria described in Worksheet No. 12.0 will be used. Data quality deficiencies must be brought to the attention of all Project Team members for their consideration as to how the deficiencies effect attainment of project objectives (see also Worksheet No. 5.4). If any data gaps are identified, including missing or rejected data, the Project Team will assess whether project objectives can be achieved despite the existence of data gaps. This assessment will depend on the number and type of identified data gaps. All Project Team stakeholders will be involved in rendering the final conclusion regarding adequacy of the data. U-flagged values will not be used to classify a sampling point as contaminated.

5.6 SAMPLING DESIGN AND RATONALE

The Project Team considered the volume of soil that corresponds to lateral spacing between sampling locations and agreed that approximately 10 to 40 feet between sampling locations would limit the total potential excavation costs reasonably well. This decision was based on an expectation that very few locations need to be investigated deeper than approximately 5 feet bgs in the TCE Area and 2 feet bgs in the metals contamination area, as well as the relatively small size of the UST Area. To simplify implementation of this SAP, all samples will be submitted for laboratory analysis of area-specific target analytes listed in Worksheet No. 5.3 (rather than using field screening to aid delineation of contamination).

Additional details are provided in Worksheet Nos. 7.0 and 9.0, and Table 8-1.

6.0 – Field Quality Control Samples

(UFP-QAPP Manual Section 2.6.2 – Worksheet #12)

Quality Control (QC) Sample	Analytical Group	Frequency	Data Quality Indicators (DQIs)	Measurement Performance Criteria (MPCs)	QC Sample Assesses Error for Sampling (S), Analytical (A) or Both (S&A)
Trip Blanks	VOCs (both TCE Contamination and UST Areas)	One per cooler containing VOC samples.	Bias/Contamination	No analytes ≥ ½ limit of quantitation (LOQ), except common laboratory contaminants, which must be < LOQ.	S & A
Duplicate Samples	All analytical groups	One per 20 field samples collected per matrix	Precision	Values > 5x LOQ: Relative Percent Difference (RPD) ≤50%. If duplicate values are < 5x LOQ, absolute difference should be < 4x LOQ.	S & A
Cooler Temperature Indicator	All analytical groups	One per cooler.	Representativeness	Temperature must be between 0 and 6 degrees Celsius (°C).	S

Note: Equipment rinsate blanks are not needed because the Navy accepts the liability of accidentally contaminating a sample such that its concentration appears to exceed an MCS, when it really does not exceed the MCS.

7.0 -- Sampling Design and Rationale

(UFP-QAPP Manual Section 3.1.1 – Worksheet #17)

TCE Contamination Area: The RFI identified chlorinated-solvent contaminated groundwater as presenting excess risk and recommended that a CMS be conducted. The primary risk drivers were Carbon Tetrachloride, cis-1,2-Dichloroethene, 1,1,2-Trichloroethane, Trichloroethene, Tetrachloroethene and Vinyl Chloride. During the evaluation of corrective measures source removal (i.e. excavation) of chlorinated-solvent contaminated soils followed by monitored natural attenuation (MNA) was identified as the recommended alternative for groundwater. This excavation will be conducted as an interim measure. In order to accomplish the interim measure additional data is required to determine the extent of soil contaminated above MCS for the constituents which are the primary risk drivers for groundwater use.

UST Area: The UST, which was discovered after completion of the RFI, is suspected to have been used for the storage of fuels. The constituent target list was chosen based on potential constituents which might have been released from the tank if used to store fuels. These target constituents are Appendix IX VOCs, DRO and GRO.

Metals Contamination Area: The RFI identified four metals, antimony, copper, lead and zinc as presenting excess risk to ecological receptors and recommended that a CMS be conducted. Excavation of contaminated surface soils was identified as the recommended alternative for remediation of excess ecological risk. This excavation will be conducted as an interim measure. As part of the CMS process toxicity testing was conducted to develop site-specific media cleanup standards. In order to efficiently accomplish the soil removal additional data is required to determine the extent of soils contaminated above the site-specific MCS for antimony, copper, lead and zinc.

The sampling strategy for SWMU 16 is to implement soil delineation sampling for the IMWP phase of the project at two discrete areas (TCE Contamination Area and Metals Contamination Area) in order to provide for prescriptive sampling prior to soil excavation. The IMWP will define the horizontal and vertical extent of soil excavations to meet each MCS. No confirmation sampling will be required.

In addition, a UST was identified after the completion of RFI field activities. Therefore, it was not investigated during the RFI, and no information is available regarding the occurrence of releases or soil quality near the tank. Soil samples will be collected in the vicinity of the UST to determine the presence (i.e., >MCS) or absence (i.e., ≤ MCS) of contamination associated with the tank. If present in concentrations above the MCS, determine the horizontal and vertical extent of contamination.

The following discusses the sampling locations, media to be sampled, and analyses. Sampling locations are illustrated on Figures 7-1 through 7-3, and a matrix table of samples is provided in Table 8-1. Soil borings will be advanced using direct-push technology (DPT) (macrocore samplers) or hand auger methods to collect surface and subsurface soil samples, surface soil only locations (Metals Contamination Area) will be sampled using a hand auger.

In the TCE and Metals Contamination Areas, soil sample locations were selected to target areas with unknown soil concentrations of the COCs, located between the "contaminated" (i.e., >MCS) and "clean" (i.e., ≤ MCS) soils boundaries, based on RFI data for TCE and metals of concern in order to refine the areas of soil contamination requiring removal.

In the TCE Contamination Area, soil borings will consist of up to three soil samples to be collected from each soil boring location; one surface soil (0.5 to 2 feet bgs for VOCs) from select locations, one subsurface soil from 2 to 6 feet bgs, and one subsurface soil sample from the 2-foot soil interval directly above the bedrock surface. Sample collection for VOC parameters will follow the methodology described in SOP-07. Bedrock is expected to be approximately 6 to 8 feet bgs in the area of sampling. In the Metals Contamination Area, only surface soil samples (0 to 2 feet bgs) will be collected from each sample location.

The sampling locations represent areas not previously investigated. The spacing between sampling locations was driven primarily by the need to delineate contamination laterally, especially in the TCE and metals contamination areas that have already been investigated. In these areas, bedrock depth is shallow and sampling deeper than approximately 5 feet bgs is not possible at many locations. The intent is to bound the total volume of soil to be excavated to an acceptable maximum volume. This will be done by connecting the innermost sampling locations that have target analyte concentrations less than MCSs so that, when connected to form a three-dimensional polygon, they enclose the minimum volume of soil with target analyte concentrations greater than MCSs.

In the UST Area, surface and subsurface soil samples will be collected to determine the presence/absence of contamination, and if present, whether it is present above MCS.

Groundwater occurs in bedrock in the area of SWMU 16; therefore, groundwater will not be encountered during this soil investigation.

Sampling and other field task methodologies are described in Worksheet No. 8.1.

7.1 TCE CONTAMINATION AREA

Soil Borings

Thirty-six soil borings (16SB118 through 16SB153) will be advanced with the use of a DPT drill rig within the area west and north of Building 146 within SWMU 16 (Figure 7-1). Up to three soil samples will be collected from each soil boring location: one surface soil (0.5 to 2 feet bgs), and up to two subsurface soil samples, depending on soil depth above bedrock Only one subsurface soil sample will be collected if the bedrock is less than 6 feet bgs. The subsurface soil samples will be collected from 2 to 6 feet bgs and the 2-foot soil interval above the bedrock surface.

The soil samples will be analyzed for TCE Contamination Area VOCs.

NOTE: Collection of the soil sample from the appropriate interval for VOC analyses is critical. When determining the specific location within the soil boring for sample collection, the following hierarchy must be followed:

If elevated volatile organics are measured via the PID, collect the VOC samples from the specific interval where the highest PID reading is measured. If no above-background PID readings are measured, then the VOC sample will be collected from a specific interval where visual signs of contamination (staining, etc.) are observed. If no above-background PID reading is measured, and no discoloration or odor in the soil core indicates potential contamination, then collect the VOC sample from near the center of the core at the bottom of the interval.

7.2 METALS CONTAMINATION AREA

Surface Soil

Thirty-seven hand auger soil borings (16SB154 through 16SB190) will be advanced within the area south of Building 146 (Figure 7-2). The sample locations were selected to further delineate and refine the area of known metals contamination, based on RFI data. One surface soil sample (0 to 2 feet bgs) will be collected from each soil boring location.

The soil samples will be analyzed for antimony, copper, lead, and zinc.

7.3 UST AREA SOIL SAMPLING

Soil Borings

Eight soil borings (16SB191 through 16SB198) will be advanced within the area surrounding the UST, which is located approximately 120 feet north of Building 146 within SWMU 16 (Figure 7-3). The boring locations were selected to identify and delineate the potential presence of soil contamination associated with the tank. Up to three soil samples will be collected from each soil boring location: one surface soil (0.5 to 2 feet bgs), and two subsurface soil samples. The subsurface soil samples will be collected from 2 to 6 feet bgs and 6 to 10 feet bgs, or the 2-foot soil interval above the bedrock surface, if bedrock is encountered at a depth shallower than 10 feet bgs.

The historic or current contents of the UST are unknown; however, the highest probability is that it was used to store fuel oil (most likely diesel/fuel oil No. 2). As a conservative measure, the soil samples will be analyzed for UST Area VOCs, TPH-GRO, TPH DRO, and lead (in case the tank contained leaded gasoline at one time).

NOTE: See the discussion regarding the collection of soil samples for VOC analyses in Section 7.1.

8.0 – Field Project Implementation (Field Project Instructions)

(UFP-QAPP Manual Section 5.2.3)

8.1 FIELD PROJECT TASKS

(UFP-QAPP Manual Section 2.8.1 – Worksheet #14)

Site-specific SOPs have been developed for field activities at NSA Crane and are located in Appendix A. Field tasks are summarized below with a short description for each task.

- Mobilization/Demobilization
- Utility Clearance
- Site-Specific Health and Safety Training
- Sample Collection Tasks
- Surface and Subsurface Soil Sampling
- GPS Locating
- Investigation-Derived Waste (IDW) Management
- Field Decontamination Procedures
- Sample Handling
- QC

Mobilization/Demobilization

Mobilization will consist of the delivery of all equipment, materials, and supplies to the site, complete assembly in satisfactory working order of all such equipment at the site, and satisfactory storage at the site of all such materials and supplies. The Tetra Tech FOL or designee will coordinate with the NSA Crane ERSM to identify appropriate locations for the storage of equipment and supplies. Site-specific health and safety training for all Tetra Tech field personnel and subcontractors will be provided as part of site mobilization.

Demobilization will consist of the prompt and timely removal of all equipment, materials, and supplies from the site following completion of the work. Demobilization includes the cleanup and removal of waste generated during the performance of the investigation.

Utility Clearance

One week prior to the commencement of any subsurface intrusive activities, the Tetra Tech FOL or designee will contact IUPPS to complete a utility clearance ticket for the areas under investigation. Work permits, if required by the facility, will be obtained prior to conducting field activities. The Tetra Tech FOL will be responsible for coordinating these activities.

Site-Specific Health and Safety Training

There are no specialized/non-routine project-specific training requirements or certifications needed by personnel to successfully complete the project or tasks. All field personnel will have appropriate training to conduct the field activities to which they are assigned. Each site worker will be required to have completed the Occupational Safety and Health Administration (OSHA) 40-hour course (and 8-hour refresher, if applicable) in health and safety training. Safety requirements are addressed in greater detail in the site-specific Health and Safety Plan (HASP).

Sample Collection Tasks

The sampling and analysis program is outlined in Worksheet No. 7.0 and Table 8-1. Sample collection will be in accordance with the site-specific SOPs listed in Worksheet No. 8.2 and provided in Appendix A. The sampling requirements for each type of analysis (i.e., bottleware, preservation, holding time) are listed in Table 8-2. Field and laboratory QC samples will also be collected as outlined in Table 8-3.

Surface and Subsurface Soil Sampling

Surface and subsurface soil samples will be collected in accordance with SOP-05 (Borehole Advancement and Soil Coring Using DPT and Hand Auger Techniques, Appendix A). Surface soil only samples will be collected with a hand auger within the area of metals contamination delineation and where DPT access may be limited. Combined surface soil and subsurface soil samples locations (all other locations) will be collected using a DPT. The soil borings will be described by the field personnel in accordance with SOP-06 (Soil Sample Logging, Appendix A). Any qualitative visual signs of potential contamination (such as soil staining) will be noted on the soil boring log. The surface and subsurface soil samples will be collected in accordance with SOP-07 (Surface and Subsurface Soil Sampling, Appendix A).

Global Positioning System Locating

A GPS unit will be used to locate all soil sampling points in accordance with SOP-09 (Global Positioning System, Appendix A). The GPS equipment will be checked on control monuments before and after each day's use; these checks will be documented in the field notebook. To ensure sub-meter accuracy, the GPS SOP requires a minimum of six satellites to capture a position.

Investigation-Derived Waste Management

Solid or semi-solid IDW in the form of soil will be generated during field activities, including during collection of subsurface samples using DPT. Soil will be replaced into the boring from which it was removed.

IDW generated, including personal protective equipment (PPE) and decontamination fluids, will be handled in accordance with SOP-10 (Management of Investigation-Derived Waste, Appendix A).

Field Decontamination Procedures

Decontamination of sampling equipment will not be necessary for dedicated and disposable hand trowels. Decontamination of reusable sampling equipment (e.g., non-disposable hand trowels, hand augers, and DPT sampling equipment) will be conducted prior to sampling and between samples at each location. Decontamination of equipment will be conducted according to the sequence established in SOP-08 (Decontamination of Field Sampling Equipment, Appendix A).

Field Documentation Procedures

Field documentation will be performed in accordance with SOP-03 (Sample Custody and Documentation of Field Activity, Appendix A).

Sample Handling

Methods for sample handling will be in accordance with SOP-03 (Sample Custody and Documentation of Field Activities, Appendix A). Sample containers will be provided certified-clean (I-Chem 300 or equivalent) from the analytical laboratory. Sample labeling will be in accordance with SOP-01 (Sample Labeling, Appendix A), and the sample numbering scheme will be in accordance with Table 8-1 and SOP-02 (Sample Identification and Nomenclature, Appendix A). The selection of sample containers, sample preservation, packaging, and shipping will be in accordance with Table 8-2 and SOP-04 (Sample Preservation, Packaging, and Shipping, Appendix A).

Quality Control Tasks

QA/QC samples will be collected at frequencies listed in Worksheet No. 6.0.

ADDITIONAL PROJECT-RELATED TASKS

Additional project-related tasks include:

- Analytical tasks
- Data management
- Data review
- Project reports

Analytical Tasks

Chemical analyses will be performed by RTI, which is a Department of Defense (DoD) Environmental Laboratory Accreditation Program (ELAP)-accredited laboratory. A copy of RTI's accreditation and most recent EPA performance evaluation results are included in Appendix B. Analyses will be performed in accordance with the analytical methods identified in Table 8-2. RTI will meet the MCSs specified in Worksheet No. 9.0 and will perform the chemical analyses following laboratory-specific SOPs (see Table 8-2 and Worksheet 10.0) developed based on the methods listed in Table 8-2.

All soil results will be reported by the laboratory on an adjusted dry-weight basis. Results of percent moisture will be reported in each analytical data package and associated electronic data files. This information will also be captured in the project database, which will eventually be uploaded to the Naval Installation Restoration Information Solution (NIRIS) database. Percent moisture information will also be captured in the CMS Report.

The analytical data packages provided by RTI will be in a Contract Laboratory Program-like format and will be fully validatable and contain raw data, summary forms for all sample and laboratory method blank data, and summary forms containing all method-specific QC (results, recoveries, relative percent differences (RPDs), relative standard deviations (RSD), and/or percent differences, etc.).

Data Management

The principal data generated for this project will be from field data and laboratory analytical data. Field sampling log sheets will be organized by date and medium, and filed in the project files. The field logbooks for this project will be used only for this site and will also be categorized and maintained in the project files after the completion of the field program. Project personnel completing concurrent field sampling activities may maintain multiple field logbooks. When possible, logbooks will be segregated by sampling activity. The field logbooks will be titled based on date and activity.

The data handling procedures to be followed by RTI will meet the requirements of the technical specifications. Electronic data results will be automatically downloaded into the Tetra Tech database in accordance with the proprietary Tetra Tech processes.

The Tetra Tech PM (or designee) is responsible for the overall tracking and control of data generated for the project.

- **Data Tracking**. Data are tracked from generation to archiving in the Tetra Tech project-specific files. The Tetra Tech Project Chemist (or designee) is responsible for tracking the samples collected and shipped to Empirical. Upon receipt of the data packages from RTI, the Tetra Tech Project Chemist will monitor the data validation effort, which includes verifying that the data packages are complete and results for all samples have been delivered by RTI.

- **Data Storage, Archiving, and Retrieval**. The data packages received from RTI are tracked in the data validation logbook. After the data are validated, the data packages are entered into the Tetra Tech Navy CLEAN file system and archived in secure files. The field records including field log books, sample logs, chain-of-custody records, and field calibration logs will be submitted by the Tetra Tech FOL to be entered into the Navy CLEAN file system prior to archiving in secure project files. Project files are audited for accuracy and completeness. At the completion of the Navy contract, the records will be stored by Tetra Tech.

- **Data Security**. Access to Tetra Tech project files is restricted to designated personnel only. Records can only be borrowed temporarily from the project file using a sign-out system. The Tetra Tech Data Manager maintains the electronic data files, and access to the data files is restricted to qualified personnel only. File and data backup procedures are routinely performed.

- **Electronic Data**. All electronic data will be compiled into a NIRIS Electronic Data Deliverable (NEDD) and loaded into NIRIS.

- **Data Review**. This review comprises data verification, validation, and usability assessment. The data verification and validation processes and requirements are described in Worksheet No. 6.0. The data usability assessment will, at a minimum, constitute evaluation of the following characteristics to ensure that the amount, type, and quality of data are sufficient to achieve project objectives. The means of conducting these evaluations will vary depending on the nature of the data. For example, soil borings and well construction logs will generally be evaluated qualitatively or semiquantitatively whereas precision, accuracy, and sensitivity of analytical data will generally be evaluated quantitatively and may be based on, or may supplement, data validation findings. Examples include:

- Comparing actual to intended sampling locations and verifying that the correct datum was used to delineate contamination

- Evaluating trends across sample delivery groups or sampling events

- Assessing quantitative relationships between parameters (e.g., relative magnitudes of TCE and its degradation product concentrations)

- Identifying potential errant or outlier data points

- Assessing planning assumption validity

- Evaluating the potential for contamination of samples by samplers

Data quality indicators to be evaluated during this assessment include:

1. **Precision.** A semiquantitative estimate of the uncertainty in contaminant concentrations as a function of location will be made.

2. **Accuracy.** Accuracy data will be evaluated to ensure sampling and measurement accuracy is within or exceeds analytical method specifications and may depend in part on the data validation findings.

3. **Representativeness.** This evaluation will assess whether the data are adequately representative of intended populations based on the sample collection and data generation requirements specified in this SAP.

4. **Completeness.** Failure to obtain critical data from planned locations will be documented. Minor variations in actual versus intended sampling locations (or depths) that do not adversely affect the attainment of project objectives will not be documented.

5. **Comparability.** This will be accomplished by comparing overall precision and bias among data sets for each matrix and analytical fraction for each sampled area. This will not require quantitative comparisons unless the Tetra Tech Project Chemist indicates that such quantitative analysis is beneficial to the project and the Tetra Tech PM agrees.

6. **Sensitivity.** The Tetra Tech Project Chemist will determine whether project sensitivity goals were achieved by comparing non-detect values to MCSs.

7. **Other quantitative characteristics.** These may include quantities such as verification of soil volume calculations, soil disposal cost estimates, etc., that are used to determine whether the contaminants are sufficiently well delineated to estimate remediation costs.

If significant data quality deficiencies are detected that prevent the attainment of project objectives, the limitations on the affected data will be described in the project report. The Tetra Tech PM will bring these deficiencies to the attention of the project team for their evaluation and the team will determine an appropriate corrective action depending on the circumstances.

8.2 FIELD SOPs REFERENCE TABLE

(UFP-QAPP Manual Section 3.1.2 – Worksheet #21)

Reference Number	Title, Revision Date, and/or Number	Originating Organization of Sampling SOP	Equipment Type	Modified for Project Work? (Y/N)	Comments
SOP-01	Sample Labeling, 02/11, Revision 0.	Tetra Tech	Not Applicable (NA)	N	Contained in Appendix A
SOP-02	Sample Identification Nomenclature, 02/11, Revision 0.	Tetra Tech	NA	Y	Contained in Appendix A
SOP-03	Sample Custody and Documentation of Field Activities, 02/11, Revision 0.	Tetra Tech	Field logbook, sample log sheets, boring logs	N	Contained in Appendix A
SOP-04	Sample Preservation, Packaging, and Shipping, 02/11, Revision 0.	Tetra Tech	NA	N	Contained in Appendix A
SOP-05	Borehole Advancement and Soil Coring Using Direct-Push Technology (DPT) and Hand Auger Techniques, 02/11, Revision 0.	Tetra Tech	DPT rig, stainless steel augers, extension rods, and T-handle	N	Contained in Appendix A
SOP-06	Soil Sample Logging, 02/11, Revision 0.	Tetra Tech	NA	N	Contained in Appendix A
SOP-07	Surface and Subsurface Soil Sampling, 02/11, Revision 0.	Tetra Tech	Stainless steel auger bucket, extension rods, and T-handle, photoionization detector (PID)	N	Contained in Appendix A
SOP-08	Decontamination of Field Sampling Equipment, 02/11, Revision 0.	Tetra Tech	Decontamination equipment, scrub brushes, 5-gallon buckets, spray bottles, phosphate free detergent, de-ionized water	N	Contained in Appendix A
SOP-09	Global Positioning System, 02/11, Revision 0.	Tetra Tech	GPS unit	N	Contained in Appendix A
SOP-10	Management of Investigation-Derived Waste, 02/11, Revision 0.	Tetra Tech	NA	Y	Contained in Appendix A

Table 8-1 – Sample Details Table

(UFP-QAPP Manual Section 3.1.1 and 3.5.2.3 – Worksheet #18, 19, 20 and 30)

Sample Location	Sample ID(1)	Analyses		
		TCE Contamination Area VOCs	Metals Contamination Area	UST Area VOCs, TPH-GRO TPH-DRO, Lead
SOIL – TCE Contamination Area				
16SB118	16SB1180002	1	-- (2)	--
	16SB1180206	1	--	--
	16SB118XXXX	1	--	--
16SB119	16SB1190002	1	--	--
	16SB1190206	1	--	--
	16SB119XXXX	1	--	--
16SB120	16SB1200002	1	--	--
	16SB1200206	1	--	--
	16SB120XXXX	1	--	--
16SB121	16SB1210002	1	--	--
	16SB1210206	1	--	--
	16SB121XXXX	1	--	--
16SB122	16SB1220002	1	--	--
	16SB1220206	1	--	--
	16SB122XXXX	1	--	--
16SB123	16SB1230002	1	--	--
	16SB1230206	1	--	--
	16SB123XXXX	1	--	--
16SB124	16SB1240002	1	--	--
	16SB1240206	1	--	--
	16SB124XXXX	1	--	--
16SB125	16SB1250002	1	--	--
	16SB1250206	1	--	--
	16SB125XXXX	1	--	--
16SB126	16SB1260002	1	--	--
	16SB1260206	1	--	--
	16SB126XXXX	1	--	--
16SB127	16SB1270002	1	--	--
	16SB1270206	1	--	--
	16SB127XXXX	1	--	--

Sample Location	Sample ID[1]	Analyses		
		TCE Contamination Area VOCs	**Metals Contamination Area**	**UST Area VOCs, TPH-GRO TPH-DRO, Lead**
16SB128	16SB1280002	1	--	--
	16SB1280206	1	--	--
	16SB128XXXX	1	--	--
16SB129	16SB1290002	1	--	--
	16SB1290206	1	--	--
	16SB129XXXX	1	--	--
16SB130	16SB1300002	1	--	--
	16SB1300206	1	--	--
	16SB130XXXX	1	--	--
16SB131	16SB1310002	1	--	--
	16SB1310206	1	--	--
	16SB131XXXX	1	--	--
16SB132	16SB1320002	1	--	--
	16SB1320206	1	--	--
	16SB132XXXX	1	--	--
16SB133	16SB1330002	1	--	--
	16SB1330206	1	--	--
	16SB133XXXX	1	--	--
16SB134	16SB1180002	1	--	--
	16SB1340206	1	--	--
	16SB134XXXX	1	--	--
16SB135	16SB1350002	1	--	--
	16SB1350206	1	--	--
	16SB135XXXX	1	--	--
16SB136	16SB1360002	1	--	--
	16SB1360206	1	--	--
	16SB136XXXX	1	--	--
16SB137	16SB1370002	1	--	--
	16SB1370206	1	--	--
	16SB137XXXX	1	--	--
16SB138	16SB1380002	1	--	--
	16SB1380206	1	--	--
	16SB138XXXX	1	--	--
16SB139	16SB1390002	1	--	--
	16SB1390206	1	--	--
	16SB139XXXX	1	--	--

Sample Location	Sample ID[1]	Analyses		
		TCE Contamination Area VOCs	Metals Contamination Area	UST Area VOCs, TPH-GRO TPH-DRO, Lead
16SB140	16SB1400002	1	--	--
	16SB1400206	1	--	--
	16SB140XXXX	1	--	--
16SB141	16SB1410002	1	--	--
	16SB1410206	1	--	--
	16SB141XXXX	1	--	--
16SB142	16SB1420002	1	--	--
	16SB1420206	1	--	--
	16SB142XXXX	1	--	--
16SB143	16SB1430002	1	--	--
	16SB1430206	1	--	--
	16SB143XXXX	1	--	--
16SB144	16SB1440002	1	--	--
	16SB144-0206	1	--	--
	16SB144XXXX	1	--	--
16SB145	16SB1240002	1	--	--
	16SB1240206	1	--	--
	16SB124XXXX	1	--	--
16SB146	16SB1460002	1	--	--
	16SB1460206	1	--	--
	16SB146XXXX	1	--	--
16SB147	16SB1470002	1	--	--
	16SB1470206	1	--	--
	16SB147XXXX	1	--	--
16SB148	16SB1480002	1	--	--
	16SB1480206	1	--	--
	16SB148XXXX	1	--	--
16SB149	16SB1490002	1	--	--
	16SB1490206	1	--	--
	16SB149XXXX	1	--	--
16SB150	16SB1500002	1	--	--
	16SB1500206	1	--	--
	16SB150XXXX	1	--	--
16SB151	16SB1510002	1	--	--
	16SB1510206	1	--	--
	16SB151XXXX	1	--	--

Sample Location	Sample ID(1)	Analyses		
		TCE Contamination Area VOCs	**Metals Contamination Area**	**UST Area VOCs, TPH-GRO TPH-DRO, Lead**
16SB152	16SB1520002	1	--	--
	16SB1520206	1	--	--
	16SB152XXXX	1	--	--
16SB153	16SB1530002	1	--	--
	16SB1530206	1	--	--
	16SB153XXXX	1	--	--
SOIL –Metals Contamination Area				
16SB154	16SB1540002	--	1	--
16SB155	16SB1550002	--	1	--
16SB156	16SB1560002	--	1	--
16SB157	16SB1570002	--	1	--
16SB158	16SB1580002	--	1	--
16SB159	16SB1590002	--	1	--
16SB160	16SB1600002	--	1	--
16SB161	16SB1610002	--	1	--
16SB162	16SB1620002	--	1	--
16SB163	16SB1630002	--	1	--
16SB164	16SB1640002	--	1	--
16SB165	16SB1650002	--	1	--
16SB166	16SB1660002	--	1	--
16SB167	16SB1670002	--	1	--
16SB168	16SB1680002	--	1	--
16SB169	16SB1690002	--	1	--
16SB170	16SB1700002	--	1	--
16SB171	16SB1710002	--	1	--
16SB172	16SB1720002	--	1	--
16SB173	16SB1730002	--	1	--
16SB174	16SB1740002	--	1	--
16SB175	16SB1750002	--	1	--
16SB176	16SB1760002	--	1	--
16SB177	16SB1770002	--	1	--
16SB178	16SB1780002	--	1	--
16SB179	16SB1790002	--	1	--
16SB180	16SB1800002	--	1	--
16SB181	16SB1810002	--	1	--
16SB182	16SB1820002	--	1	--
16SB183	16SB1830002	--	1	--

Sample Location	Sample ID[1]	Analyses		
		TCE Contamination Area VOCs	Metals Contamination Area	UST Area VOCs, TPH-GRO TPH-DRO, Lead
16SB184	16SB1840002	--	1	--
16SB185	16SB1850002	--	1	--
16SB186	16SB1860002	--	1	--
16SB187	16SB1870002	--	1	--
16SB188	16SB1880002	--	1	--
16SB189	16SB1890002	--	1	--
16SB190	16SB1900002	--	1	--
SOIL – UST Area				
16SB191	16SB1910002	--	--	1
	16SB1910206	--	--	1
	16SB191XXXX	--	--	1
16SB192	16SB1920002	--	--	1
	16SB1920206	--	--	1
	16SB192XXXX	--	--	1
16SB193	16SB1930002	--	--	1
	16SB1930206	--	--	1
	16SB193XXXX	--	--	1
16SB194	16SB1940002	--	--	1
	16SB1940206	--	--	1
	16SB194XXXX	--	--	1
16SB195	16SB1950002	--	--	1
	16SB1950206	--	--	1
	16SB195XXXX	--	--	1
16SB196	16SB1960002	--	--	1
	16SB1960206	--	--	1
	16SB196XXXX	--	--	1
16SB197	16SB1970002	--	--	1
	16SB1970206	--	--	1
	16SB197XXXX	--	--	1
16SB198	16SB1980002	--	--	1
	16SB1980206	--	--	1
	16SB198XXXX	--	--	1

1. . XXXX represents the interval of the sample from below 2 feet bgs and above top of bedrock. For example, if the sample is collected from 2 to 6 feet bgs, the depth will be recorded as 0206.
2. -- Not analyzed

Table 8-2 -- Analytical SOP Requirements Table

Laboratory point of contact, e-mail address, and phone number: Chino Ortiz, cortiz@rtilab.com, 734-422-8000
Laboratory Name and Address:
RTI Laboratories, Inc.
31627 Glendale Street
Livonia, MI 48150
Data Package Turnaround time: 21 days
Tentative Sampling Dates: To be determined (TBD)

Matrix	Analytical Group	Analytical And Preparation Method/ SOP Reference (1)	Containers (number, size, and type)	Sample Volume (units)	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation/ analysis)
Soil	TCE Contamination Area and UST Area VOCs	SW-846 5035A/8260B/RTI SOP 8260B_110810_R7	Three 5-gram (g) (collected using Terra Cores), three 40-milliliter (mL) glass vials with magnetic stir bars, and One 2-ounce (oz.) wide mouth jar for percent moisture	5 g	One vial 5-mLVOC-free water, One vial of 5-mL VOC-free water with sodium bisulfate, One vial of 5-mL methanol, cool to ≤ 6°C; lab to freeze to < -10°C upon receipt	14 days to analysis
Soil	Metals (including Lead only)	SW-846 3050B, 6020A/RTI SOP 3050_091410_R9, 6020_072810_R8,	4-oz wide-mouth jar	2 g	Cool to ≤ 6°C	180 days to analysis
Soil	TPH DRO	SW-846 3550B/8015B/ RTI SOP 8015BDRO_ORO_100110 _R1_1	One 4-oz glass jar with a Teflon-lined lid	25 g	Cool to ≤ 6°C	14 days until extraction, 40 days to analysis

Matrix	**Analytical Group**	**Analytical And Preparation Method/ SOP Reference** (1)	**Containers** (number, size, and type)	**Sample Volume** (units)	**Preservation Requirements** (chemical, temperature, light protected)	**Maximum Holding Time** (preparation/ analysis)
Soil	TPH GRO	SW-846 5035A/8015B/RTI SOP 8015BGRO_110810_R2	Two 5 g (collected using Terra Cores), two 40-mL glass vials with magnetic stir bars, and One 2- oz. wide mouth jar for percent moisture	5 g	Two vials of 5 mL methanol, cool to ≤ 6°C; lab to freeze to < -10°C upon receipt	14 days to analysis

Notes:

1 Specify the appropriate reference letter or number from the Analytical SOP References table (Worksheet No. 10.0).

Table 8-3 -- Field Quality Control Sample Summary Table

Matrix	Analytical Group	No. of Samples	No. of MS/MSDs(1)	No. of Duplicate Samples(2)	No. of VOC Trip Blanks(3)	Total No. of Samples to Lab
Surface Soil	TCE Contamination Area VOCs	36	2/2	2	5	43
	UST Area VOCs	8	1/1	1	1	10
	Metals	37	2/2	2	0	39
	Lead Only	8	1/1	1	0	9
	TPH-DRO	8	1/1	1	0	9
	TPH GRO	8	1/1	1	0	9
Subsurface Soil	TCE Contamination Area VOCs	72	4/4	4	0	76
	UST Area VOCs	16	1/1	1	0	17
	Lead Only	16	1/1	1	0	17
	TPH-DRO	16	1/1	1	0	17
	TPH GRO	16	1/1	1	0	17

1 Although MS/MSDs are not typically considered field QC samples, they are included here because location determination is often established in the field. The MS/MSDs are not included in the total number of samples sent to the laboratory.
2 One duplicate sample will be collected for every 20 environmental samples collected.
3. One trip blank per VOC sample cooler per day will be collected; the quantity identified above is an estimate.

9.0 – Reference Limits and Evaluation Tables

(UFP-QAPP Manual Section 2.8.1 – Worksheet #15)

Analyte	CAS Number	MCS (mg/kg)	MCS Reference[1]	PQLG (mg/kg)	RTI		
					LOQ (mg/kg)	LOD (mg/kg)	DL (mg/kg)
UST Area VOCs (EPA Method 8260B)							
1,1,1,2-Tetrachloroethane	**630-20-6**	**0.004**	**CMD**	**0.00132**	**0.005**	**0.003**	**0.001205**
1,1,1-Trichloroethane	71-55-6	1.4	MCL-SSL	0.462	0.005	0.003	0.00082
1,1,2,2-Tetrachloroethane	**79-34-5**	**0.00052**	**RBSSL**	**0.000172**	**0.005**	**0.003**	**0.00153**
1,1,2-trichloro-1,2,2-trifluoroethane (Freon 113)	76-13-1	3,000	RBSSL	990	0.005	0.003	0.00152
1,1,2-Trichloroethane	79-00-5	0.032	MCL-SSL	0.01056	0.005	0.003	0.001055
1,1-Dichloroethane	75-34-3	0.0138	RBSSL	0.004554	0.005	0.003	0.00104
1,1-Dichloroethene	75-35-4	0.05	MCL-SSL	0.0165	0.005	0.003	0.001065
1,2,3- Trichlorobenzene	87-61-6	1.74	RBSSL	0.5742	0.005	0.003	0.001495
1,2,4-Trichlorobenzene	120-82-1	4	MCL-SSL	1.32	0.025	0.003	0.00194
1,2-Dibromo-3-chloropropane (DBCP)	**96-12-8**	**0.00172**	**MCL-SSL**	**0.0005676**	**0.010**	**0.005**	**0.004275**
1,2-Dibromoethane (EDB)	**106-93-4**	**0.00028**	**MCL-SSL**	**0.0000924**	**0.005**	**0.003**	**0.00116**
1,2-Dichlorobenzene	95-50-1	11.6	MCL-SSL	3.828	0.005	0.003	0.0012
1,2-Dichloroethane	107-06-2	0.028	MCL-SSL	0.00924	0.005	0.003	0.00092
1,2-Dichloropropane	78-87-5	0.034	MCL-SSL	0.01122	0.005	0.003	0.001355
1,3-Dichlorobenzene	541-73-1	2.3	IDEM-RDCL	0.759	0.005	0.003	0.001065
1,4-Dichlorobenzene	106-46-7	1.44	MCL-SSL	0.4752	0.005	0.003	0.000945
2-Butanone (MEK)	78-93-3	30	RBSSL	9.9	0.005	0.025	0.003395
2-Hexanone	591-78-6	0.22	RBSSL	0.0726	0.025	0.003	0.0017
4-Methyl-2-pentanone (MIBK)	108-10-1	9	RBSSL	2.97	0.025	0.003	0.00131
Acetone	67-64-1	90	RBSSL	29.7	0.025	0.020	0.002715
Acrolein	**107-02-8**	**0.00017**	**RBSSL**	**0.0000561**	**0.05**	**0.025**	**0.0137**
Benzene	71-43-2	0.052	MCL-SSL	0.01716	0.003	0.003	0.000815

Analyte	CAS Number	MCS (mg/kg)	MCS Reference[(1)]	PQLG (mg/kg)	RTI		
					LOQ (mg/kg)	LOD (mg/kg)	DL (mg/kg)
Bromodichloromethane	75-27-4	0.44	MCL-SSL	0.1452	0.005	0.003	0.001505
Bromoform	75-25-2	0.42	MCL-SSL	0.1386	0.005	0.003	0.00105
Bromomethane	74-83-9	0.044	RBSSL	0.01452	0.020	0.003	0.00807
Carbon disulfide	75-15-0	6.2	RBSSL	2.046	0.025	0.003	0.00227
Carbon tetrachloride	56-23-5	0.038	MCL-SSL	0.01254	0.005	0.003	0.000965
Chlorobenzene	108-90-7	1.36	MCL-SSL	0.4488	0.003	0.005	0.00086
Chloroethane	75-00-3	0.65	IDEM-RDCL	0.2145	0.025	0.003	0.00895
Chloroform	67-66-3	0.44	MCL-SSL	0.1452	0.005	0.003	0.00082
Chloromethane	74-87-3	0.98	RBSSL	0.3234	0.010	0.003	0.00112
cis-1,2-Dichloroethene	156-59-2	0.42	MCL-SSL	0.1386	0.005	0.003	0.00107
cis-1,3-Dichloropropene	**10061-01-5**	**0.003**	**RBSSL**	**0.00099**	**0.005**	**0.003**	**0.000715**
Cyclohexane	110-82-7	330	IDEM-RDCL	108.9	0.005	0.003	NE
Dibromochloromethane	124-48-1	0.42	MCL-SSL	0.1386	0.005	0.003	0.000835
Dichlorodifluoromethane	75-71-8	12.2	RBSSL	4.026	0.005	0.003	0.00098
Ethylbenzene	100-41-4	15.6	MCL-SSL	5.148	0.005	0.003	0.00104
Isopropylbenzene	98-82-8	11	IDEM-RDCL	3.63	0.005	0.003	0.00086
Methyl acetate	79-20-9	150	RBSSL	49.5	0.05	0.025	NE
Methylene chloride	75-09-2	0.026	MCL-SSL	0.00858	0.010	0.003	0.002175
Methyl-tert-butyl ether	1634-04-4	0.56	RBSSL	0.1848	0.005	0.003	0.00125
Styrene	100-42-5	2.2	MCL-SSL	0.726	0.005	0.003	0.000795
Tetrachloroethene	127-18-4	0.046	MCL-SSL	0.01518	0.005	0.003	0.00117
Toluene	108-88-3	13.8	MCL-SSL	4.554	0.005	0.003	0.001035
trans-1,2-Dichloroethene	156-60-5	0.58	MCL-SSL	0.1914	0.005	0.003	0.000805
trans-1,3-Dichloropropene	**10061-02-6**	**0.003**	**RBSSL**	**0.00099**	**0.005**	**0.003**	**0.001015**
Trichloroethene	79-01-6	0.036	MCL-SSL	0.01188	0.005	0.003	0.001915
Trichlorofluoromethane	75-69-4	16.6	RBSSL	5.478	0.005	0.003	0.000995
Vinyl acetate	108-05-4	1.76	RBSSL	0.5808	0.05	0.025	NE

Analyte	CAS Number	MCS (mg/kg)	MCS Reference[1]	PQLG (mg/kg)	RTI		
					LOQ (mg/kg)	LOD (mg/kg)	DL (mg/kg)
Vinyl chloride	75-01-4	0.0138	MCL-SSL	0.004554	0.004	0.003	0.00098
Xylenes (total)	1330-20-7	196	MCL-SSL	64.68	0.015	7.5	0.003055
Total Petroleum Hydrocarbons (EPA Method 8015B)							
DRO (C8-C28) Diesel Range	NA	230	IDEM-RDCL	75.9	1.7	NA	1.3
GRO (C5-C12) Gasoline Range	NA	120	IDEM-RDCL	39.6	3.0	1.0	0.631
Metals Contamination Area (EPA Method 3050B, 6020A)							
Antimony	7440-36-0	6.3	Eco SSL	2.079	0.25	0.05	0.0046
Copper	7440-50-8	253	Eco SSL	83.49	0.5	0.05	0.0076
Lead	7439-92-1	264	Eco SSL	87.12	0.1	0.05	0.0031
Zinc	7440-66-6	1716	Eco SSL	566.28	5.0	0.5	0.001
TCE Contamination Area VOCs (EPA Method 8260B)							
Carbon tetrachloride	56-23-5	0.038	MCL-SSL	0.01254	0.005	0.003	0.000965
1,1,2-Trichloroethane	79-00-5	0.032	MCL-SSL	0.01056	0.005	0.003	0.001055
cis-1,2-Dichloroethene	156-59-2	0.42	MCL-SSL	0.1386	0.005	0.003	0.00107
trans-1,2-Dichloroethene	156-60-5	0.58	MCL-SSL	0.1914	0.005	0.003	0.000805
Tetrachloroethene	127-18-4	0.046	MCL-SSL	0.01518	0.005	0.003	0.00117
Trichloroethene	79-01-6	0.036	MCL-SSL	0.01188	0.005	0.003	0.001915
Vinyl chloride	75-01-4	0.0138	MCL-SSL	0.004554	0.004	0.003	0.00098

Notes:

CAS – Chemical Abstracts Service
mg/kg – milligrams per kilogram
PQLG – Project Quantitation Limit Goal
LOQ – Limit of Quantitation
LOD – Limit of Detection
DL – Detection Limit
NE- Not Evaluated

1 The MCS references for surface and subsurface soil are, in order of hierarchy: MCL-SSL - USEPA Regions 3, 6, and 9 Risk-Based Soil Screening Level, Migration to Groundwater, MCL-Based Dilution Attenuation Factor (DAF) = 20 (November, 2010); RBSSL - USEPA Regions 3, 6, and 9 Risk-Based Soil Screening Level, Migration to Groundwater, DAF = 20 (November, 2010); IDEM-RDCL – IDEM Residential Default Closure Level, Migration to Groundwater

(May, 2009); Eco SSL – site-specific ecological risk-based values derived from the toxicity/bioaccumulation testing conducted by Tetra Tech (Tetra Tech, 2011c) .

Bolded rows indicate that the MCS is between the laboratory LOQ and LOD. The Project Team has agreed to accept this data for decision making if results below the LOQ are “J” qualified and the results will be discussed in the uncertainties section of the CMD Report.

Bolded and Shaded rows indicate the MCS is less than the LOD; therefore, the Project Team has agreed to report non-detected results at the LOD and any limitations on data use that result from having detection limits (i.e. data qualified U) that are greater than MCSs will be described in the CMD Report.

10.0 – Analytical SOP Reference Table

(UFP-QAPP Manual Section 3.2.1 – Worksheet #23)

Lab SOP Number	Title, Revision Date, and/or Number	Definitive or Screening Data	Matrix and Analytical Group	Instrument	Organization Performing Analysis	Variance to DOD Quality Systems Manual (QSM)? (Y OR N)	Modified for Project Work? (Y/N)
RTI 3050_091410_R9	Acid Digestion of Solid Samples for the Analysis of Total Metals (Revision 9, 09/14/10)	Definitive	Soil – Metals	NA/ Preparation	RTI	N	N
RTI 6020_072810_R8	Analysis of Elements by Inductively Coupled Plasma-Mass Spectrometry (Revision 8, 07/28/10)	Definitive	Soil– Metals	Inductively Coupled Plasma - Mass Spectroscopy (ICP-MS)	RTI	N	N
RTI 8260B_110810_R7	Analysis of Volatile Organic Compounds by GC/MS (Revision 7, 11/08/10)	Definitive	Soil and aqueous QC samples – VOCs	Gas Chromatograph/ Mass Spectrometer (GC/MS)	RTI	N	N
RTI 8015BGRO_110810_R2	Analysis of Gasoline Range Organic Compounds, Revision 2, 11/08/10	Definitive	Soil samples- TPH GRO	GC/Flame Ionization Detector (FID)	RTI	NA	N
RTI SOP-8015BDRO_ORO_100110_R1_1	Analysis Of Diesel And Oil (Residual/Lube) Range Organic Compounds, Revision 1.1, 10/01/10	Definitive	Soil samples - TPH DRO	GC/Flame Ionization Detector (FID)	RTI	NA	N

Lab SOP Number	Title, Revision Date, and/or Number	Definitive or Screening Data	Matrix and Analytical Group	Instrument	Organization Performing Analysis	Variance to DOD Quality Systems Manual (QSM)? (Y OR N)	Modified for Project Work? (Y/N)
3510C_110909_R7	Liquid-Liquid Extraction Procedure for Semi-volatile Organic Compounds, Revision 7, 11/09/09	Definitive	Soil samples - DRO extraction	NA/ Extraction	RTI	NA	N

NA - Not applicable

11.0 – Laboratory QC Samples Tables

(UFP-QAPP Manual Section 3.4 – Worksheet #28)

Matrix	**Soil and Aqueous QC Samples**
Analytical Group	**TCE Contamination and UST Area VOCs**
Analytical Method / SOP Reference	**SW-846 8260B RTI SOP 8260B_110810_R7**

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	Corrective Action (CA)	Person(s) Responsible for CA	DQI	MPC
Method Blank	One per preparatory batch of 20 or fewer samples.	All target analytes must be ≤ ½ LOQ, except common lab contaminants, which must be < LOQ.	Investigate source of contamination and rerun method blank prior to analysis of samples, if possible. Evaluate the samples and associated QC: if blank results are above LOQ, then report sample results that are <LOQ or >10X the blank concentration. Re-prepare and reanalyze blank and those samples that were >LOQ and <10X the blank.	Analyst, Supervisor	Bias/ Contamination	Same as QC Acceptance Limits
Laboratory Control Sample (LCS)/ Laboratory Control Sample Duplicate (LCSD) (not required)	One per preparatory batch of 20 or fewer samples.	Percent Recoveries (%Rs) must meet the DoD QSM Version 4.1 limits as per Appendix G of the DoD QSM. RPD must be ≤ 30% (for LCS/LCSD, if LCSD is performed).	Correct problem, then reprepare and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available. Refer to DOD QSM Version 4.1 Table G-1 for number of marginal exceedences allowed. Contact Client if samples cannot be reprepared within hold time.	Analyst, Supervisor	Accuracy/ Bias Precision also, if LCSD is analyzed	Same as QC Acceptance Limits
MS/MSD	One per preparatory batch of 20 or fewer samples of similar matrix.	%Rs should meet the DoD QSM Version 4.1 limits as per Appendix G of the DoD QSM. The Relative Percent Difference (RPD) between MS and MSD should be ≤ 30%.	CA will not be taken for samples when recoveries are outside limits and surrogate and LCS criteria are met unless RPDs indicate obvious extraction/ analysis difficulties, then re-prepare and reanalyze MS/MSD.	Analyst, Supervisor	Accuracy/ Bias/ Precision	Same as QC Acceptance Limits

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	CA	Person(s) Responsible for CA	Data Quality Indicator (DQI)	Measurement Performance Criteria
Matrix	**Soil and Aqueous QC Samples**					
Analytical Group	**TCE Contamination and UST Area VOCs**					
Analytical Method / SOP Reference	**SW-846 8260B RTI SOP 8260B_110810_R7**					
Internal Standards (IS)	Every field sample, standard, and QC sample - three or four internal standards per sample.	Retention times must be within ± 30 seconds and the response areas must be within -50% to +100% of the initial calibration midpoint standard for each IS.	Inspect mass spectrometer and gas chromatograph for malfunctions; mandatory reanalysis of samples analyzed while system was malfunctioning.	Analyst, Supervisor	Accuracy	Same as QC Acceptance Limits
Surrogates	All field and QC samples – three or four surrogates per sample	%Rs must meet the DoD QSM Version 4.1 limits as per Appendix G of the DoD QSM.	If sample volume is available, then re-prepare and reanalyze sample for confirmation of matrix interference when appropriate.	Analyst, Supervisor	Accuracy/ Bias	Same as QC Acceptance Limits
Results between DL and LOQ	NA.	Apply “J” qualifier to results detected between DL and LOQ.	NA.	Analyst, Supervisor	Accuracy	Same as QC Acceptance Limits

Matrix	**Soil samples**
Analytical Group	**Metals (and Lead only)**
Analytical Method/ SOP Reference	**SW-846 6020A** **RTI 6020_072810_R8**

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Method Blank	One per preparatory batch of 20 or fewer samples per matrix.	No analytes ≥½ LOQ.	Repeat analysis. Evaluate systems for contamination sources and repeat the batch as necessary.	Analyst, Supervisor	Bias / Contamination	Same as QC Acceptance Limits.
LCS	One per preparatory batch of 20 or fewer samples per matrix.	%Rs must be 80-120%.	Investigate source of problem. Re-digest and reanalyze all associated samples.	Analyst, Supervisor	Accuracy / Bias	Same as QC Acceptance Limits.
MS/MSD	One per preparatory batch of 20 or fewer samples per matrix.	The %R should be within 80-120%, if sample < 4x spike added. RPD between MS and MSD should be ≤20%.	Dilute and re-spike/re-analyze to determine if interferences can be overcome by sample dilution. Prepare post digestion spike for analytes outside limits. Flag data as possible matrix interference.	Analyst, Supervisor	Accuracy / Bias Precision	Same as QC Acceptance Limits.
ICP Serial Dilution	One per preparatory batch of 20 or fewer samples per matrix.	The 5-fold dilution result must agree within ± 10% difference of the original sample result.	Flag result or dilute and reanalyzed sample to eliminate interference.	Analyst, Supervisor	Accuracy / Bias Precision	Same as QC Acceptance Limits.
Post-Digestion Spike	When serial dilution test fails or when all analyte concentrations are <50 x LOD.	The %R must be within 75-125% of expected value to verify the absence of an interference. Spike addition should produce a concentration of 10-100x LOQ.	Narrate.	Analyst, Supervisor	Accuracy / Bias	Same as QC Acceptance Limits.
Results between the DL and LOQ	NA.	Apply "J" qualifier to results detected between DL and LOQ.	None.	Analyst, Supervisor	Accuracy	Same as QC Acceptance Limits.

Matrix	**Soil Samples**
Analytical Group	**TPH DRO**
Analytical Method / SOP Reference	**SW-846 Method 8015B RTI SOP-8015BDRO_ORO_100110_R1_1**

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	CA	Person(s) Responsible for CA	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank	One per preparatory batch of 20 or fewer samples.	All target analytes must be ≤ ½ LOQ.	If the method blank acceptance criteria are not met, identify and correct the source of contamination, and re-prepare and reanalyze the associated samples.	Analyst, Supervisor, Data Validator	Bias/ Contamination	Same as QC Acceptance Limits
LCS	One per preparatory batch of 20 or fewer samples of similar matrix.	%R must be within 50-150% of true value.	If LCS acceptance limits are not met, the LCS should be reanalyzed once to confirm that the original analysis is reliable. If the results are still outside control limits, the associated sample must be re-extracted and reanalyzed.	Analyst, Supervisor, Data Validator	Accuracy/ Bias	Same as QC Acceptance Limits
MS/MSD	One per preparatory batch of 20 or fewer samples of similar matrix.	%Rs should be within 50-150% of true value (if sample is < 4x spike added). The RPD between MS and MSD should be ≤ 30%.	CA will not be taken for samples when %Rs are outside limits and surrogate and LCS criteria are met unless RPDs indicate obvious extraction/ analysis difficulties, then re-prepare and reanalyze MS/MSD.	Analyst, Supervisor, Data Validator	Accuracy/ Bias/ Precision	Same as QC Acceptance Limits
Surrogate	All field and QC samples - one surrogate per sample o-Terphenyl.	The %R of the surrogate must fall within 50-150%	If the surrogate %R is outside the established limits due to well-documented matrix effects, the results must be flagged and an explanation included in the report narrative.	Analyst, Supervisor, Data Validator	Accuracy	Same as QC Acceptance Limits
Results between DL and LOQ	NA.	Apply “J” qualifier to results detected between DL and LOQ.	NA.	Analyst, Supervisor, Data Validator	Accuracy	Same as QC Acceptance Limits

Matrix	**Soil Samples**
Analytical Group	**TPH GRO**
Analytical Method / SOP Reference	**SW-846 Method 8015B RTI SOP-8015BGRO_110810_R2**

QC Sample	Frequency / Number	Method / SOP QC Acceptance Limits	CA	Person(s) Responsible for CA	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank	One per preparatory batch of 20 or fewer samples.	All target analytes must be ≤ ½ LOQ.	If the method blank acceptance criteria are not met, identify and correct the source of contamination, and re-prepare and reanalyze the associated samples.	Analyst, Supervisor, Data Validator	Bias/ Contamination	Same as QC Acceptance Limits
LCS	One per preparatory batch of 20 or fewer samples of similar matrix.	%R must be within 50-150% of true value.	If LCS acceptance limits are not met, the LCS should be reanalyzed once to confirm that the original analysis is reliable. If the results are still outside control limits, the associated sample must be re-extracted and reanalyzed.	Analyst, Supervisor, Data Validator	Accuracy/ Bias	Same as QC Acceptance Limits
MS/MSD	One per preparatory batch of 20 or fewer samples of similar matrix.	%Rs should be within 50-150% of true value (if sample is < 4x spike added). The RPD between MS and MSD should be ≤ 30%.	CA will not be taken for samples when %Rs are outside limits and surrogate and LCS criteria are met unless RPDs indicate obvious extraction/ analysis difficulties, then re-prepare and reanalyze MS/MSD.	Analyst, Supervisor, Data Validator	Accuracy/ Bias/ Precision	Same as QC Acceptance Limits
Surrogate	All field and QC samples - one surrogate per sample o-Terphenyl.	The %R of the surrogate must fall within 50-150%	If the surrogate %R is outside the established limits due to well-documented matrix effects, the results must be flagged and an explanation included in the report narrative.	Analyst, Supervisor, Data Validator	Accuracy	Same as QC Acceptance Limits
Results between DL and LOQ	NA.	Apply “J” qualifier to results detected between DL and LOQ.	NA.	Analyst, Supervisor, Data Validator	Accuracy	Same as QC Acceptance Limits

12.0 – Data Verification and Validation (Steps I and IIa/IIb) Process Table

(UFP-QAPP Manual Section 5.2.1, UFP-QAPP Manual Section 5.2.2,, Figure 37 UFP-QAPP Manual, Table 9 UFP-QAPP Manual – Worksheets #34, 35, 36)

Data Review Input	Description	Responsible for Verification (name, organization)	Internal/ External
Chain of Custody Forms	The Tetra Tech FOL or designee will review and sign the chain-of-custody form to verify that all samples listed are included in the shipment to the laboratory and the sample information is accurate. The forms will be signed by the sampler and a copy will be retained for the project file, the Tetra Tech PM, and the Tetra Tech Data Validators. The Tetra Tech FOL or designee will review the chain-of-custody form to verify that all samples listed in the SAP have been collected. All deviations should be documented in the report.	Sampler and FOL, Tetra Tech	Internal
Chain of Custody Forms	1 - The Laboratory Sample Custodian will review the sample shipment for completeness and integrity, and sign accepting the shipment. 2- The Tetra Tech Data Validators will check that the chain-of-custody form was signed and dated by the Tetra Tech FOL or designee relinquishing the samples and also by the Laboratory Sample Custodian receiving the samples for analyses.	1 - Laboratory Sample Custodian, RTI 2 - Data Validators, Tetra Tech	External
Chain of Custody Forms and SAP	Ensure that the custody and integrity of the samples was maintained from collection to analysis and the custody records are complete and any deviations are recorded. Review that the samples were shipped and stored at the required temperature and preservation conditions for chemically-preserved samples meet the requirements listed in the SAP. Ensure that the analyses were performed within the holding times listed in the SAP.	Data Validators, Tetra Tech	External

Data Review Input	Description	Responsible for Verification (name, organization)	Internal/ External
Sample Log Sheets, Chain of Custody Forms, SAP, and Laboratory sample login documentation	Verify that information recorded in the log sheets is accurate and complete. Verify that samples were correctly identified, that sampling location coordinates are accurate, and that documentation establishes an unbroken trail of documented chain-of-custody from sample collection to report generation. Verify that the correct sampling and analytical methods/SOPs were applied. Verify that the sampling plan was implemented and carried out as written and that any deviations are documented. Document any discrepancies in the final report.	PM, FOL, or designee, Tetra Tech	Internal
SAP, Analytical SOPs, and Analytical Data Packages	Ensure that all laboratory SOPs were followed. Verify that the correct analytical methods/SOPs were applied. Establish that all method QC samples were analyzed and in control as listed in the analytical SOPs. If method QA is not in control, the Laboratory QAM will contact the Tetra Tech PM verbally or via e-mail for guidance prior to report preparation.	Laboratory QAM, RTI	Internal
SAP/ Chain-of-Custody Forms	Check that all field QC samples determined necessary were collected as required.	FOL or designee, Tetra Tech	Internal
Analytical Data Package	Verify all analytical data packages for completeness. The Laboratory QAM will sign the case narrative for each data package.	Laboratory QAM, RTI	Internal
Electronic Data Deliverables (EDDs)/ Analytical Data Packages	Check each EDD against the chain-of-custody and hard copy data package for accuracy and completeness. Compare laboratory analytical results to the electronic analytical results to verify accuracy. Evaluate sample results for laboratory contamination and qualify false detections using the laboratory method/preparation blank summaries. Qualify analyte concentrations between the DL and the LOQ as estimated. Remove extraneous laboratory qualifiers from the validation qualifier.	Data Validators, Tetra Tech	External
Analytical Data Package	Verify each data package for completeness. Request missing information from the Laboratory PM.	Data Validators, Tetra Tech	External

Data Review Input	Description	Responsible for Verification (name, organization)	Internal/ External
SAP/ Laboratory Data Packages/ EDDs	Ensure that the laboratory QC samples were analyzed and that the MPCs listed in were met for all field samples and QC analyses. Check that specified field QC samples were collected and analyzed and that the analytical QC criteria set up for this project were met.	Data Validators, Tetra Tech	External
SAP/ Laboratory Data Packages/ EDDs	Check the field sampling precision by calculating RPDs for field duplicate samples. Check laboratory precision by reviewing the RPD or percent difference values from laboratory duplicate analyses; MS/MSDs; and LCS/LCSD, if available. Ensure compliance with the methods and project MPCs accuracy goals listed in the SAP.	Data Validators, Tetra Tech	External
SAP/ Laboratory Data Packages/ EDDs	Check that the laboratory recorded the temperature at sample receipt and the pH of samples preserved with acid or base to ensure sample integrity from sample collection to analysis.	Data Validators, Tetra Tech	External
SAP/ Laboratory Data Packages/ EDDs	Review the chain-of-custody forms generated in the field to ensure that the required analytical samples have been collected, appropriate sample identifications have been used, and correct analytical methods have been applied. The Tetra Tech Data Validator will verify that elements of the data package required for validation are present, and if not, the laboratory will be contacted and the missing information will be requested. Check that all data have been transferred correctly and completely to the Tt SQL database.	Data Validators, Tetra Tech	External
SAP/ Laboratory Data Packages/ EDDs	Ensure that the project LOQs listed in SAP were achieved.	Data Validators, Tetra Tech	External

Data Review Input	Description	Responsible for Verification (name, organization)	Internal/ External
SAP/ Laboratory Data Packages/ EDDs	Discuss the impact on DLs that are elevated because of matrix interferences. Be especially cognizant of and evaluate the impact of sample dilutions on low-concentration analytes when the dilution was performed because of the high concentration of one or more other contaminants. Document this usability issue and inform the Tetra Tech PM. Review and add PALs to the laboratory EDDs. Flag samples and notify the Tetra Tech PM of samples that exceed PALs listed in SAP.	Data Validators, Tetra Tech	External
SAP/ Laboratory Data Packages/ EDDs	Ensure that all QC samples specified in the SAP were collected and analyzed and that the associated results were within prescribed SAP acceptance limits. Ensure that QC samples and standards prescribed in analytical SOPs were analyzed and within the prescribed control limits. If any significant QC deviations occur, the Laboratory QAM shall have contacted the Tetra Tech PM.	Data Validators, Tetra Tech	External
SAP/ Laboratory Data Packages/ EDDs	Summarize deviations from methods, procedures, or contracts in the Data Validation Report. Determine the impact of any deviation from sampling or analytical methods and SOPs requirements and matrix interferences effect on the analytical results. Qualify data results based on method or QC deviation and explain all the data qualifications. Print a copy of qualified data stored the project database to depict data qualifiers and data qualifier codes that summarize the reason for data qualifications. Determine if the data met the MPCs and determine the impact of any deviations on the technical usability of the data.	Data Validators, Tetra Tech	External
Surface and Subsurface Soil - TCE Contamination and UST Area VOCs and TPH DRO	Validation will be performed using criteria for SW-846 Methods 8260B and 8015B listed in this SAP and the current DoD QSM. The logic outlined in USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review USEPA-540/R-99-008, (USEPA, October 1999) will be used to apply qualifiers to data to the extent possible.	Data Validators, Tetra Tech	External

Data Review Input	Description	Responsible for Verification (name, organization)	Internal/ External
Surface and Subsurface Soil – Metals (and Lead Only)	Validation will be performed using criteria for SW-846 Method 6020A listed in this SAP and the current DoD QSM. The logic outlined in USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review (USEPA, October 2004) will be used to apply qualifiers to data to the extent possible.	Data Validators, Tetra Tech	External

REFERENCES

IDEM (Indiana Department of Environmental Management) 2009. Technical Guidance, Appendix I, equations A 1-5 and A 1-6 on page A.1-38, January 31, 2006 (revise May 1, 2009).

IDQTF (Interagency Data Quality Task Force), 2005. Uniform Federal Policy for Quality Assurance Project Plans. Evaluating, Assessing, and Documenting Environmental Data Collection and Use Programs, Parts 1, 2A, 2B, and 2C. Final, Version 1. March.

Tetra Tech (Tetra Tech NUS, Inc.), 2010. Draft Sampling and Analysis Plan (Field Sampling Plan and Quality Assurance Project Plan), SWMU 16 Cast High Explosives Fill/Building 146 Incinerator Toxicity Testing, Naval Support Activity Crane, Crane, Indiana. April.

Tetra Tech, 2011a. Resource Conservation and Recovery Act Facility Investigation Report for Cast High Explosives Fill/B146 Incinerator (SWMU 16), Naval Surface Warfare Center Crane, Crane, Indiana. March.

Tetra Tech, 2011c. Resource Conservation and Recovery Act Facility Investigation Report for Cast High Explosives Fill/B146 Incinerator (SWMU 16) Draft Final Technical Memorandum, Ecological Media Cleanup Goals, Surface Soil, SWMU 16, Naval Surface Warfare Center Crane, Crane, Indiana. April.

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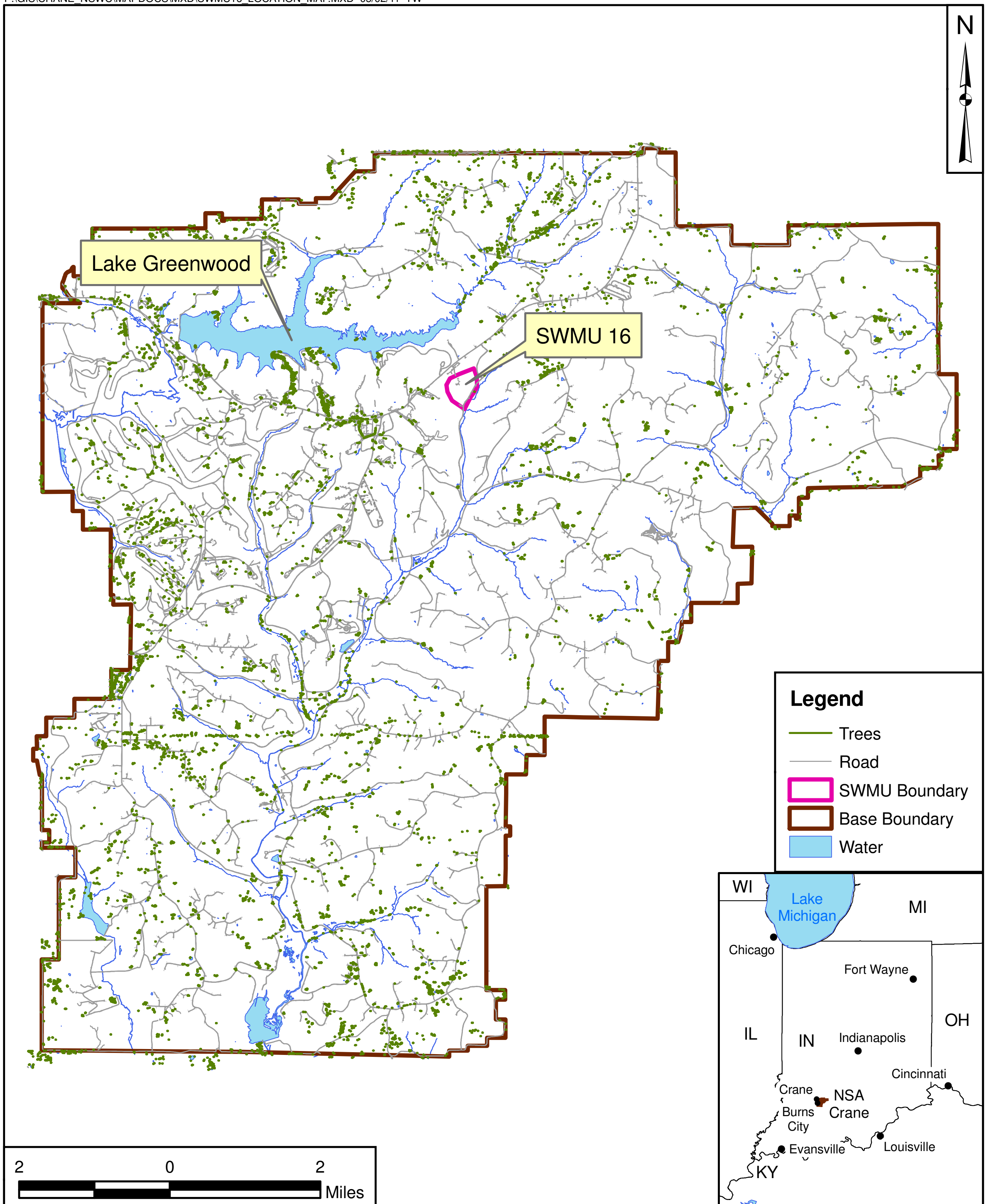

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CHECKED BY J. DUCAR	DATE 05/02/11	BASE AND SITE LOCATON MAP SWMU 16 - CAST HIGH EXPLOSIVES FILL / B146 INCINERATOR NSA CRANE CRANE, INDIANA	OWNER NO.
REVISED BY T. WHEATON	DATE 05/02/11		APPROVED BY DATE
SCALE AS NOTED			FIGURE NO. FIGURE 4-1 REV 0

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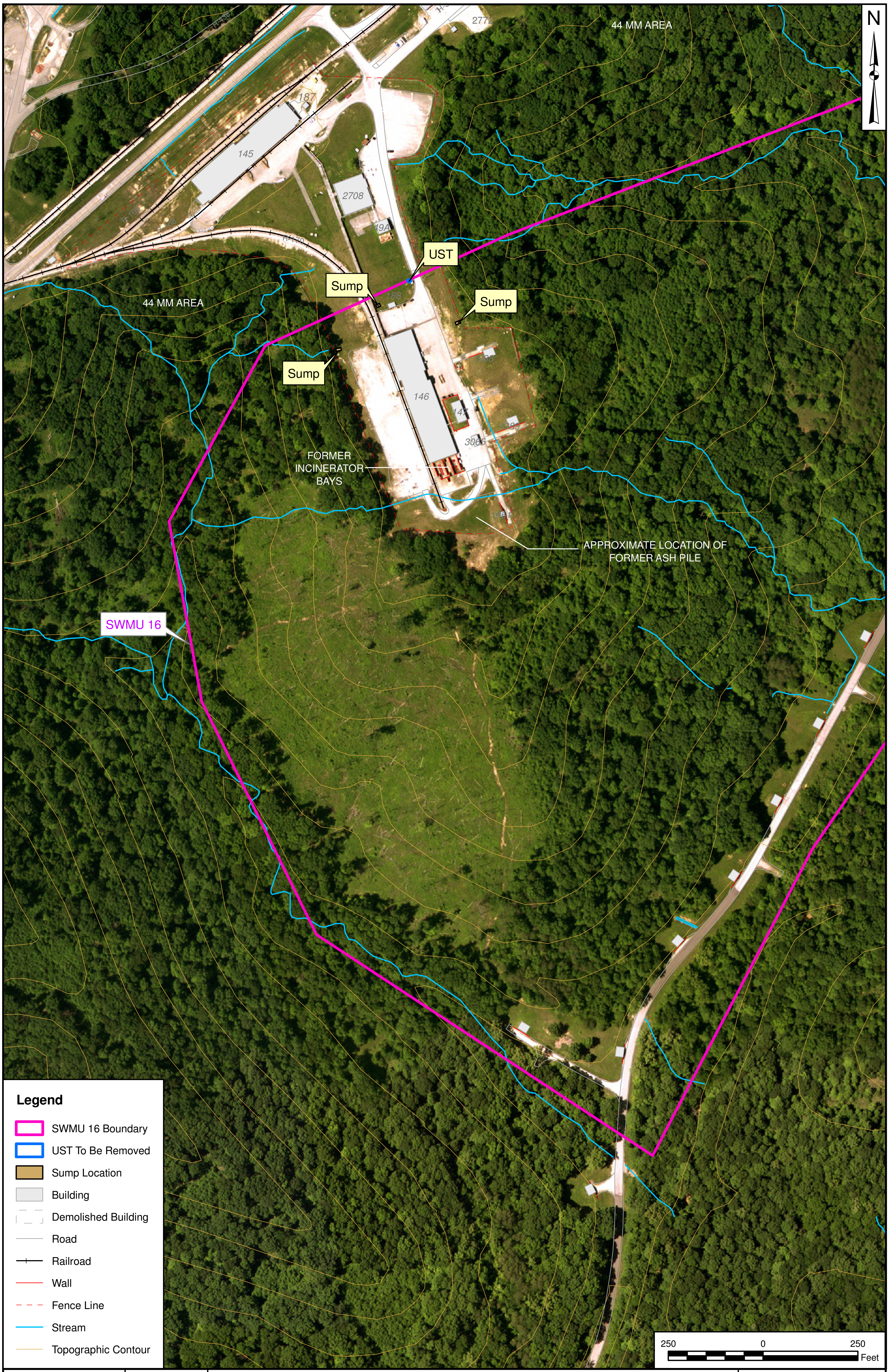

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J. DUCAR	05/02/11	NAVFAC	NSA CRANE	APPROVED BY DATE
REVISED BY	DATE		CRANE, INDIANA	FIGURE NO. REV
T. WHEATON	05/02/11			FIGURE 4-2 0
SCALE AS NOTED				

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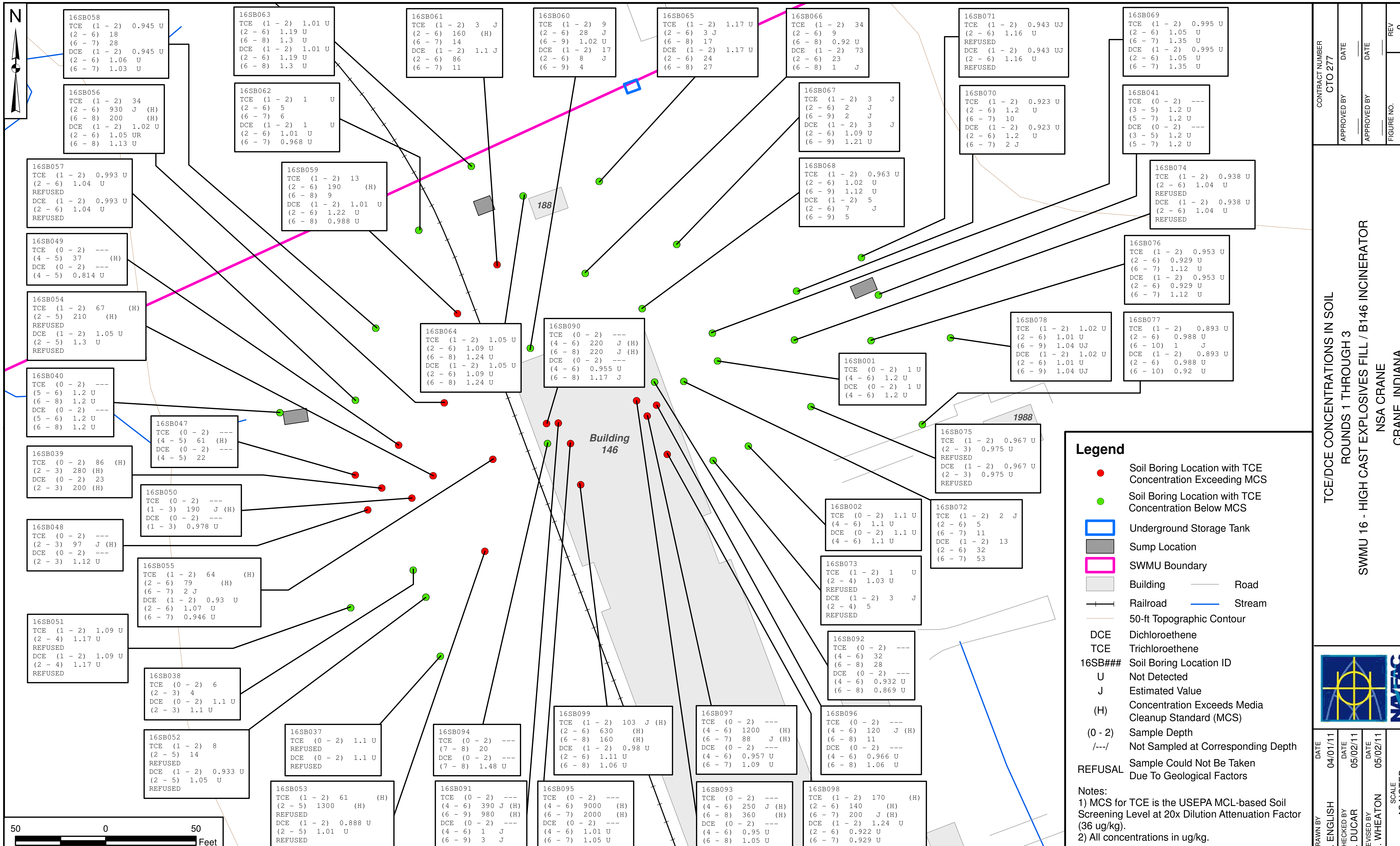

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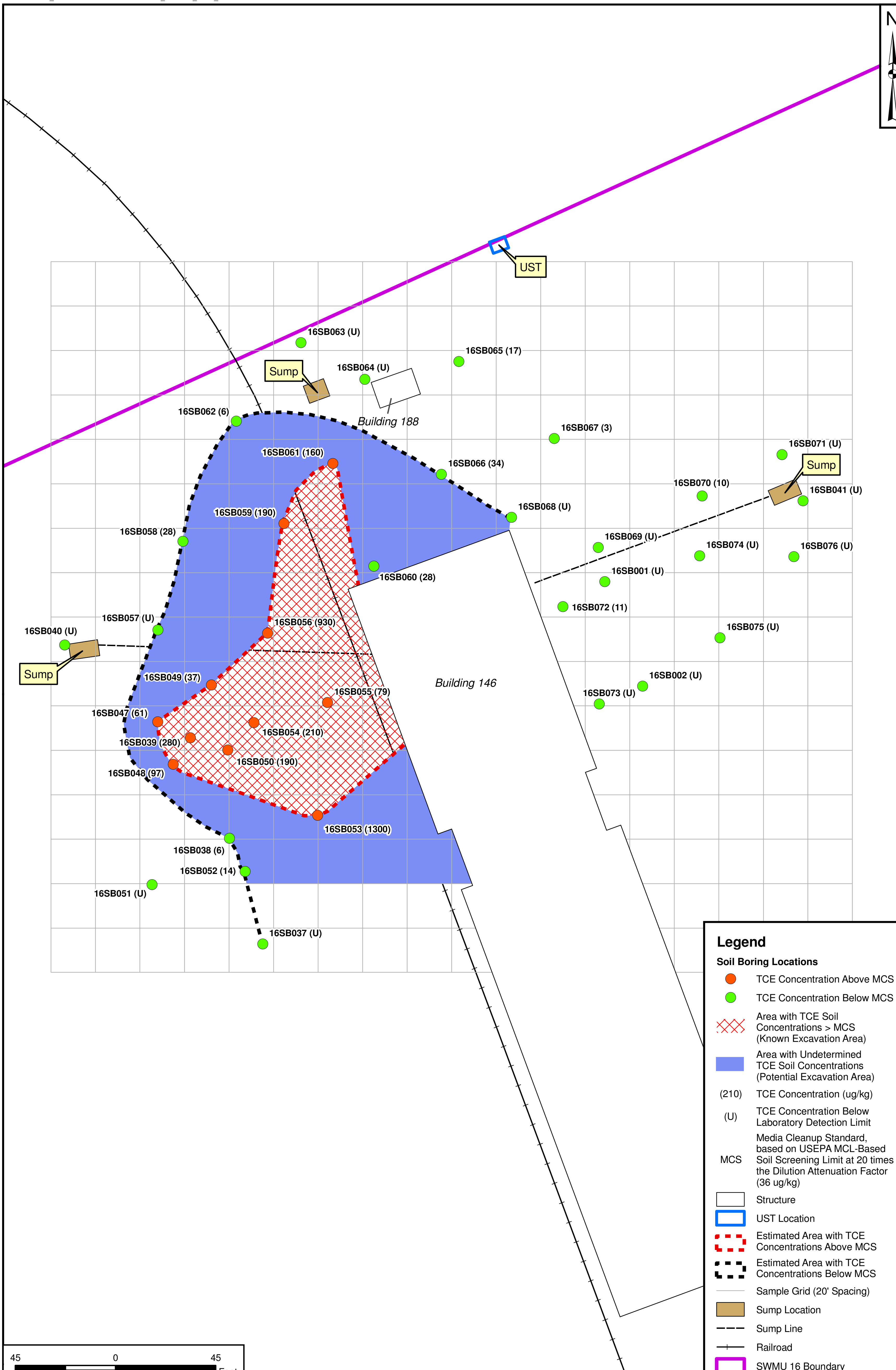

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M. MAGUIRE	03/30/11
CHECKED BY	DATE
J. DUCAR	05/02/11
REVISED BY	DATE
T. WHEATON	05/02/11
SCALE	
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NAVFAC

TCE AREA OF CONCERN
SWMU 16 CAST HIGH EXPLOSIVES FILL /
BLDG 146 INCINERATOR
NSA CRANE
CRANE, INDIANA

CONTRACT NUMBER	CTO NUMBER
	CTO 277
APPROVED BY	DATE
APPROVED BY	DATE
FIGURE NO.	REV
FIGURE 4-4	0

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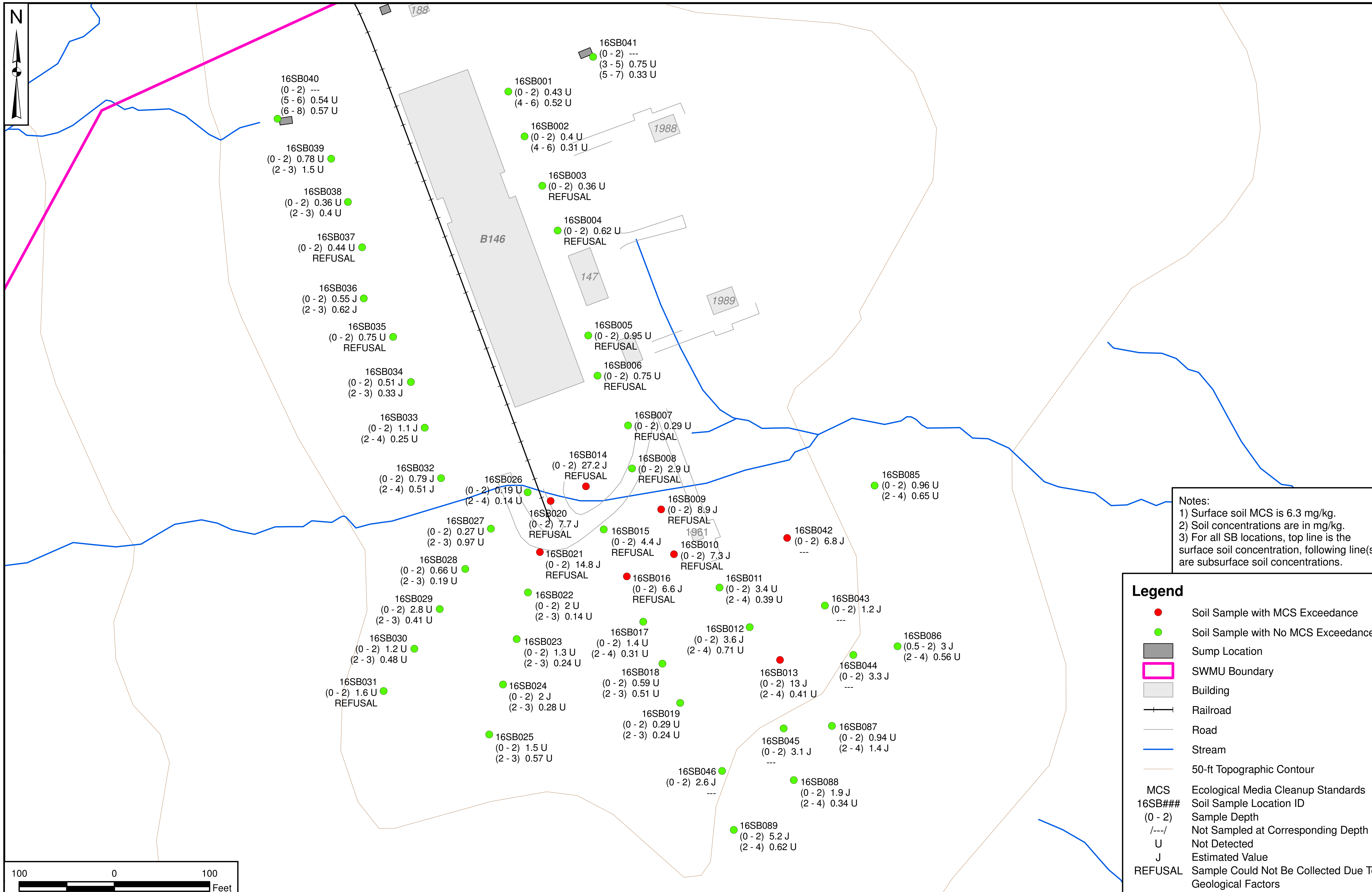

CONTRACT NUMBER CTO 277

APPROVED BY | DATE

APPROVED BY | DATE

FIGURE NO. FIGURE 4-5 | REV 0

ANTIMONY CONCENTRATIONS IN SOIL
SWMU 16 - HIGH CAST EXPLOSIVES FILL / B146 INCINERATOR
NSA CRANE
CRANE, INDIANA

NAVFAC

DRAWN BY T. WHEATON | DATE 02/21/11

CHECKED BY J. DUCAR | DATE 05/02/11

REVISED BY | DATE

SCALE AS NOTED

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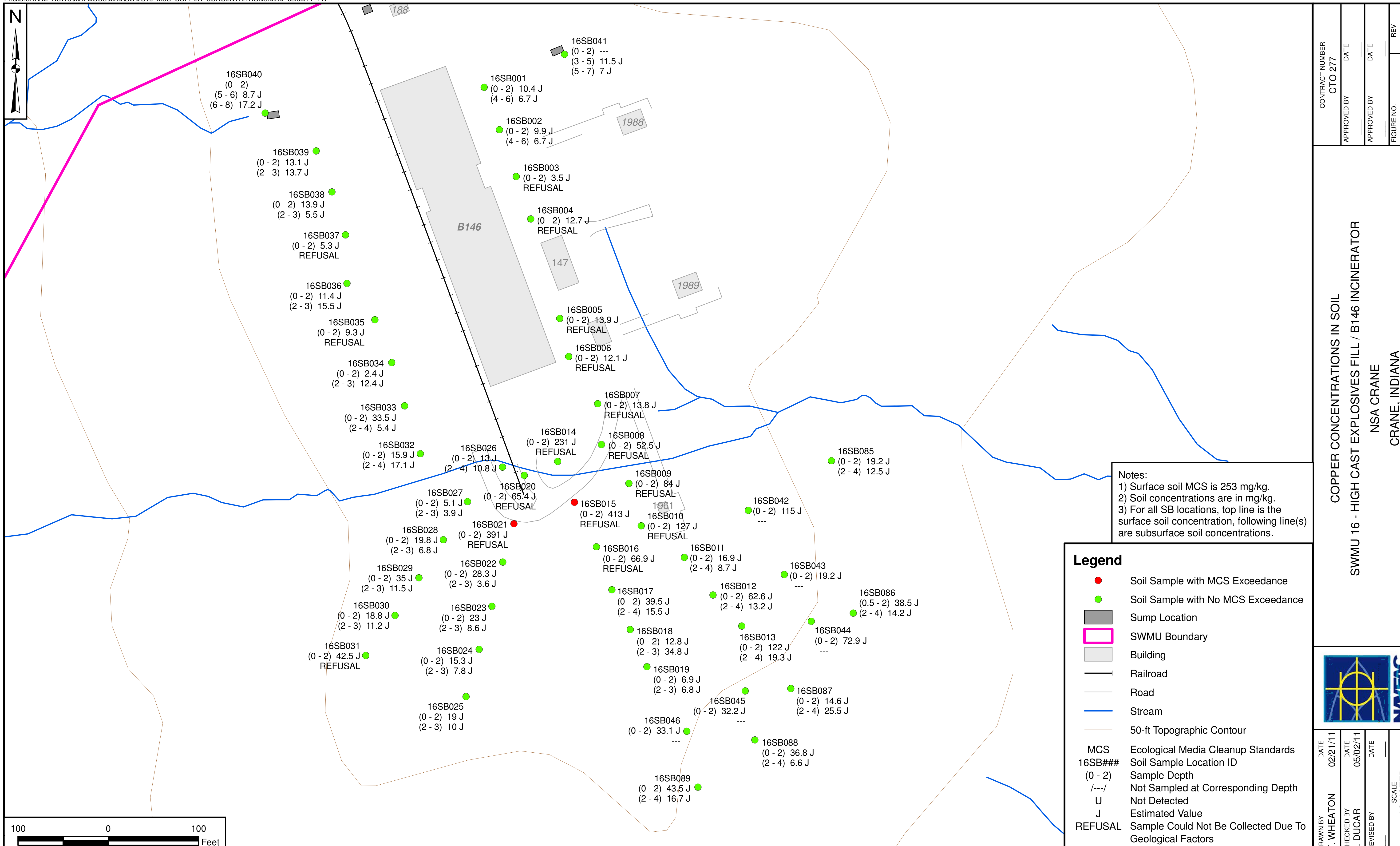

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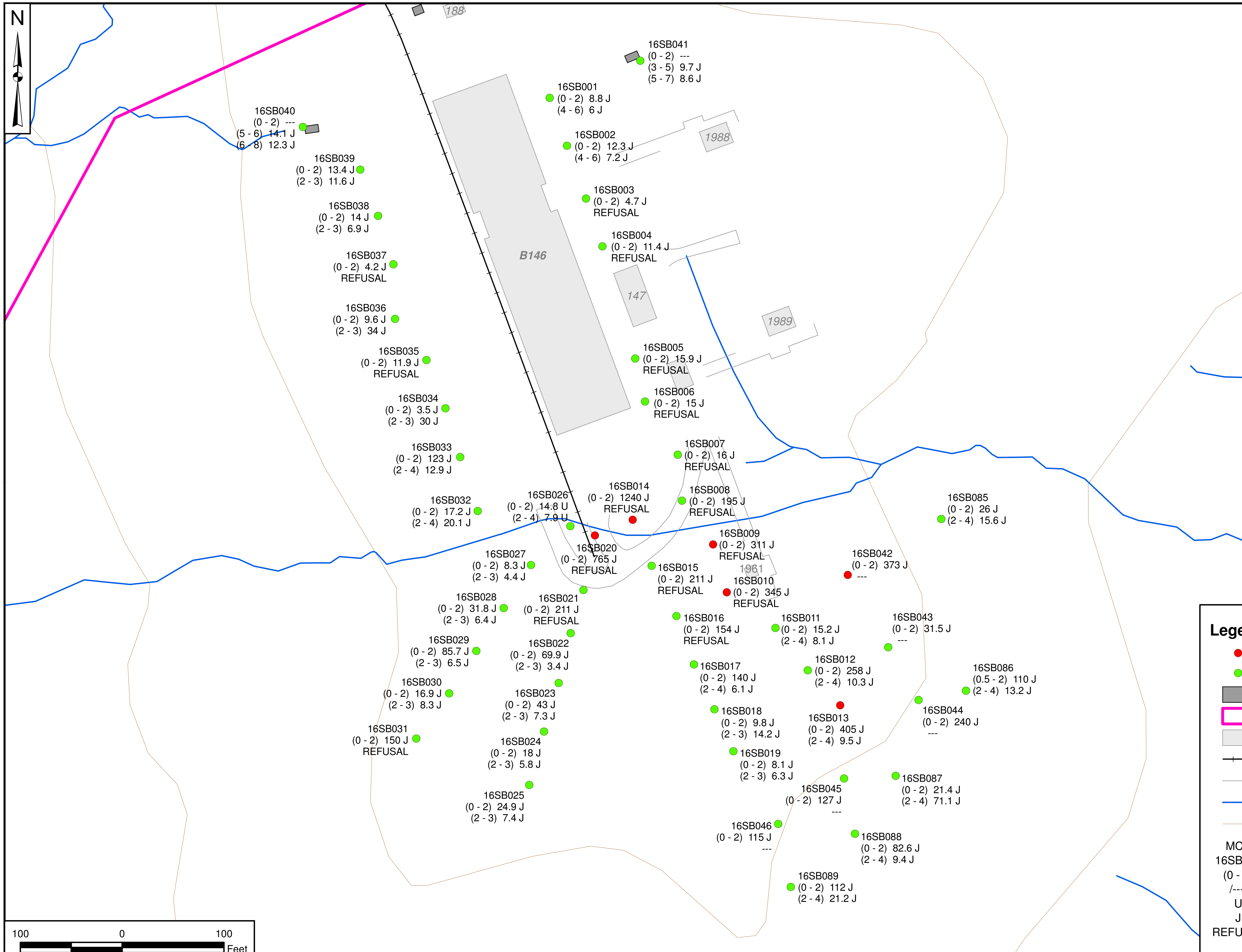

Notes:
1) Surface soil MCS is 264 mg/kg.
2) Soil concentrations are in mg/kg.
3) For all SB locations, top line is the surface soil concentration, following line(s) are subsurface soil concentrations.

Legend

- Soil Sample with MCS Exceedance
- Soil Sample with No MCS Exceedance
- Sump Location
- SWMU Boundary
- Building
- Railroad
- Road
- Stream
- 50-ft Topographic Contour

MCS	Ecological Media Cleanup Standards
16SB###	Soil Sample Location ID
(0 - 2)	Sample Depth
/---/	Not Sampled at Corresponding Depth
U	Not Detected
J	Estimated Value
REFUSAL	Sample Could Not Be Collected Due To Geological Factors

LEAD CONCENTRATIONS IN SOIL
SWMU 16 - HIGH CAST EXPLOSIVES FILL / B146 INCINERATOR
NSA CRANE
CRANE, INDIANA

CONTRACT NUMBER CTO 277
APPROVED BY — DATE —
APPROVED BY — DATE —
FIGURE NO. FIGURE 4-7 REV 0

NAVFAC

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CHECKED BY J. DUCAR DATE 05/03/11
REVISED BY — DATE —
SCALE AS NOTED

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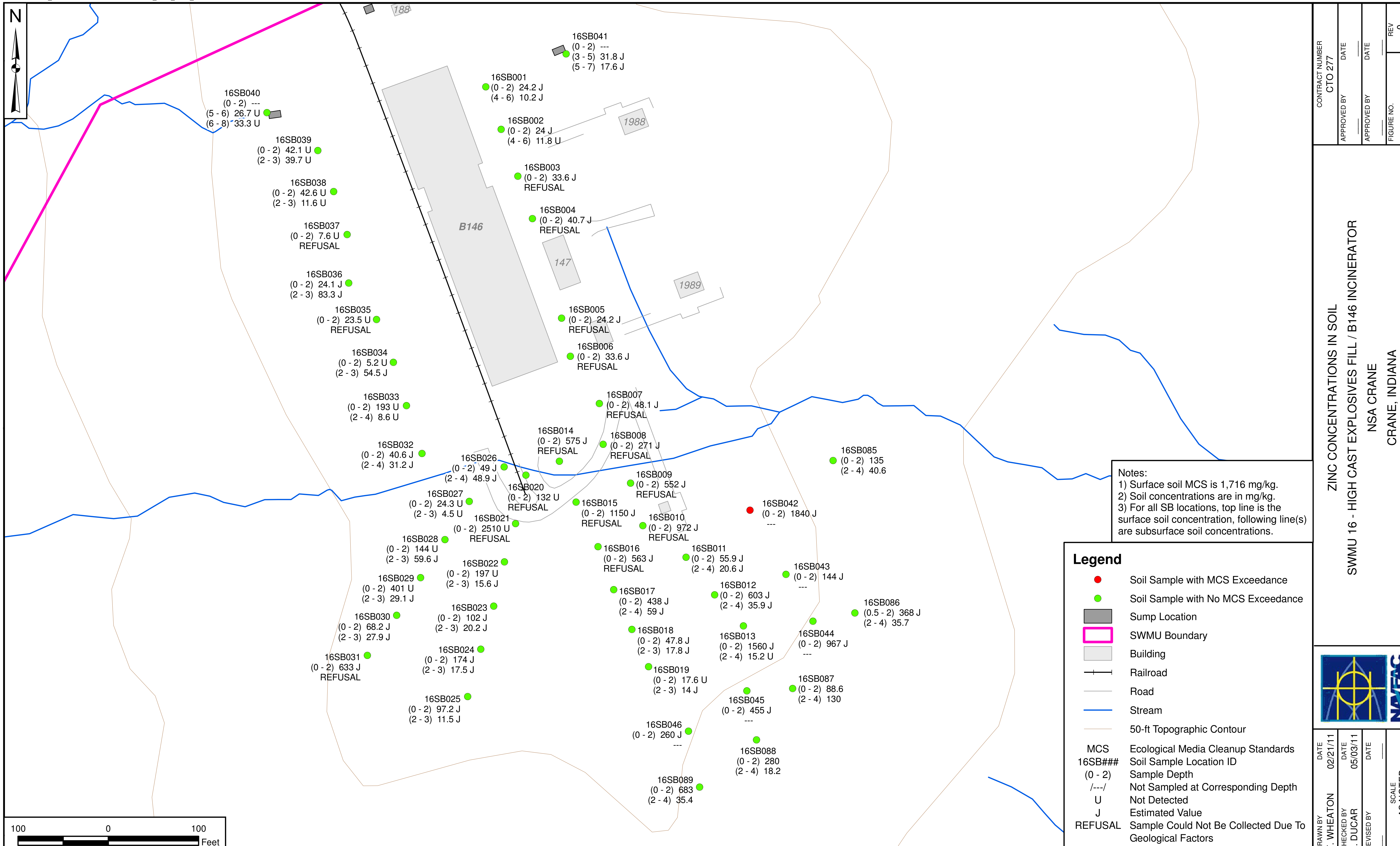

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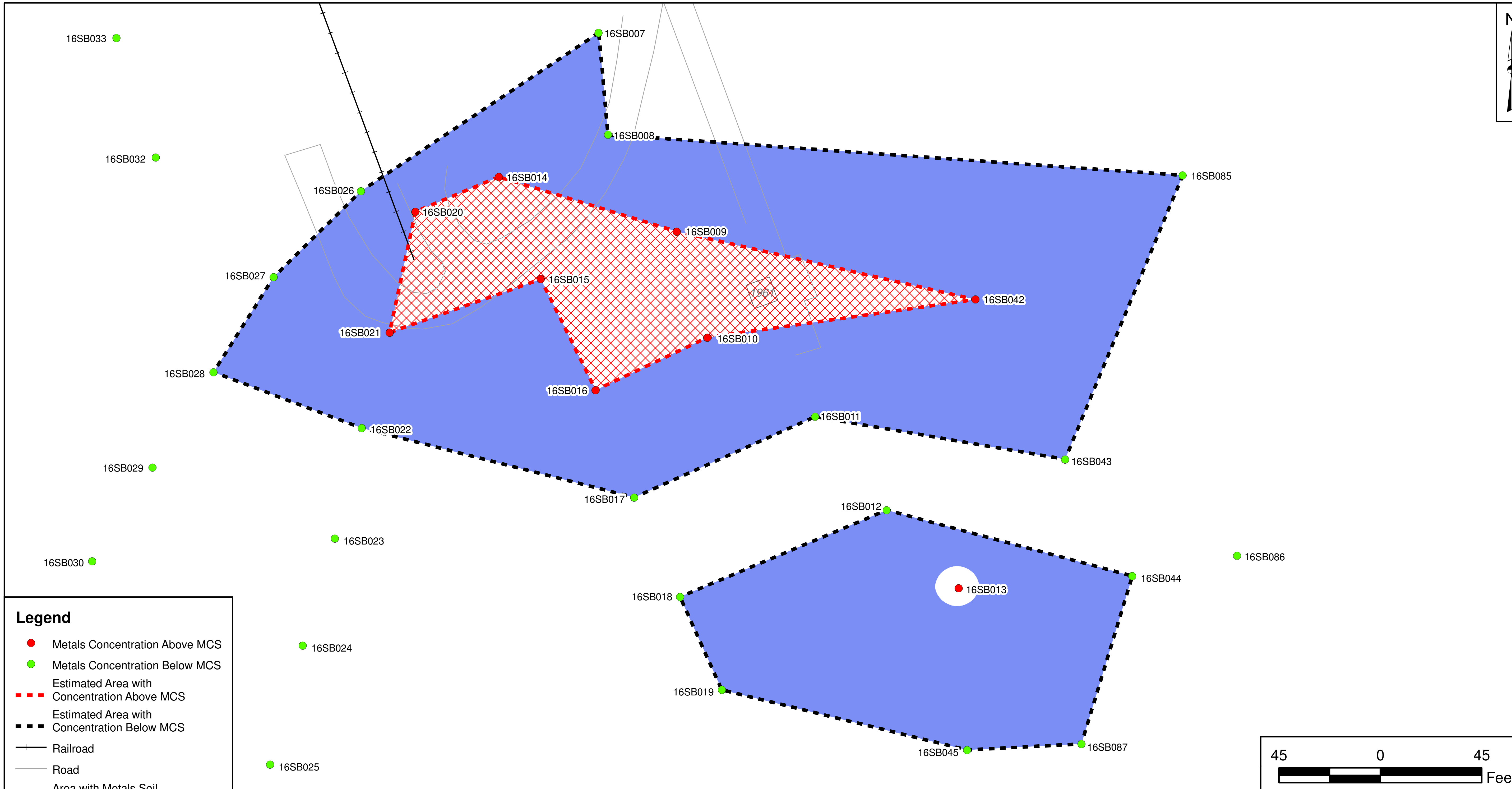

Legend

- Metals Concentration Above MCS
- Metals Concentration Below MCS
- Estimated Area with Concentration Above MCS
- Estimated Area with Concentration Below MCS
- Railroad
- Road
- Area with Metals Soil Concentrations > MCS (Known Excavation Area)
- Area with Undetermined Metals Soil Concentrations (Potential Excavation Area)
- Building
- **MCS** Media Cleanup Standard

Select Metals - Antimony, Copper, Lead and Zinc

DRAWN BY	DATE
T. WHEATON	04/21/11
CHECKED BY	DATE
J. DUCAR	05/03/11
COST/SCHEDULE-AREA	
SCALE AS NOTED	

NAVFAC

SELECT METALS AREA OF CONCERN
SWMU 16 CAST HIGH EXPLOSIVES FILL /
BLDG 146 INCINERATOR
NSA CRANE
CRANE, INDIANA

CONTRACT NUMBER CTO 277	
APPROVED BY	DATE
APPROVED BY	DATE
FIGURE NO. FIGURE 4-9	REV 0

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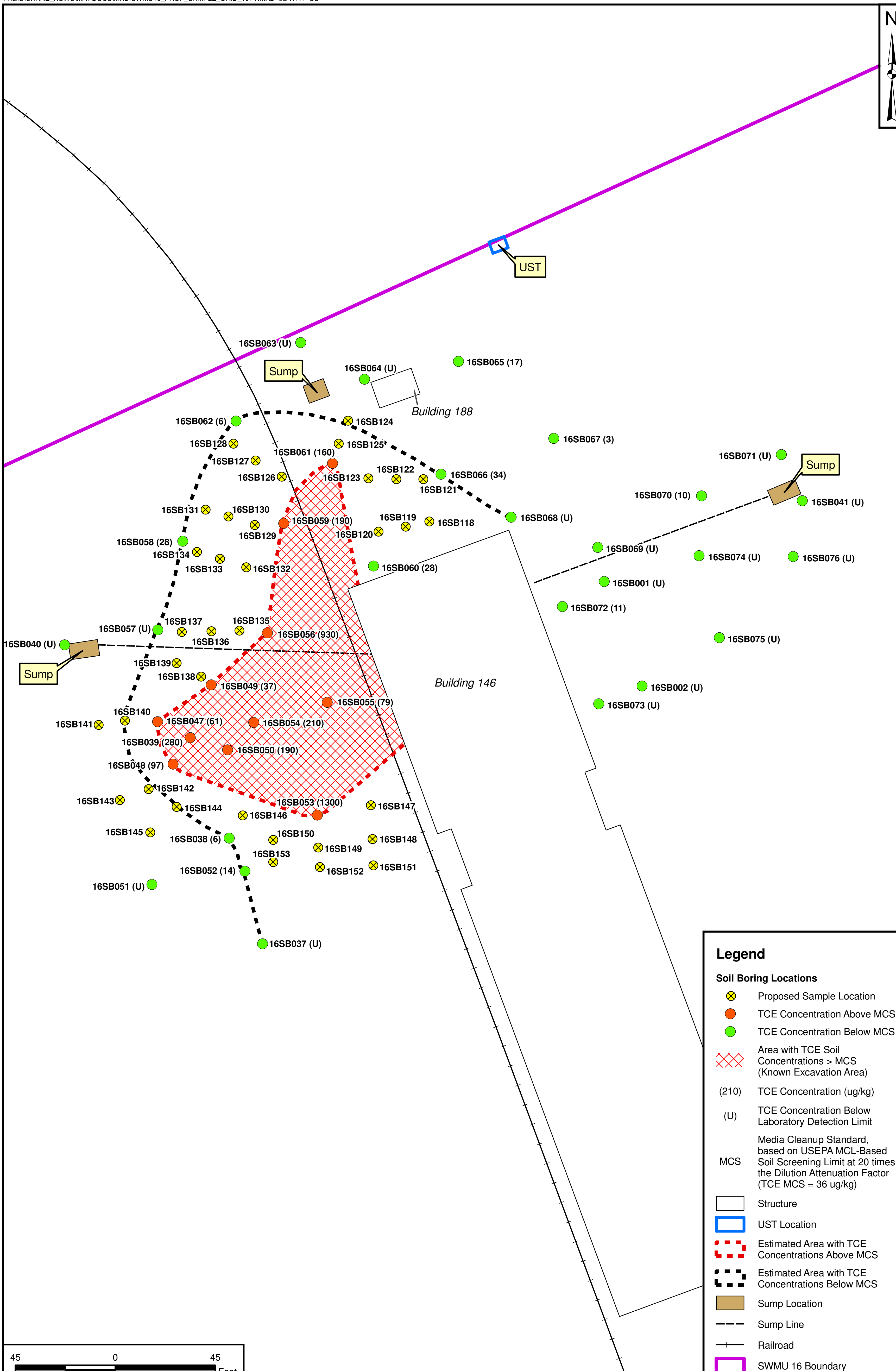

DRAWN BY T. WHEATON	DATE 04/22/11	
CHECKED BY J. DUCAR	DATE 05/17/11	
REVISED BY ___	DATE ___	
SCALE AS NOTED		

NAVFAC

PROPOSED SOIL DELINEATION SAMPLE LOCATIONS
TCE AREA OF CONCERN
SWMU 16 CAST HIGH EXPLOSIVES FILL /
BLDG 146 INCINERATOR
NSA CRANE
CRANE, INDIANA

CONTRACT NUMBER ___	CTO NUMBER CTO 277
APPROVED BY ___	DATE ___
APPROVED BY ___	DATE ___
FIGURE NO. FIGURE 7-1	REV 0

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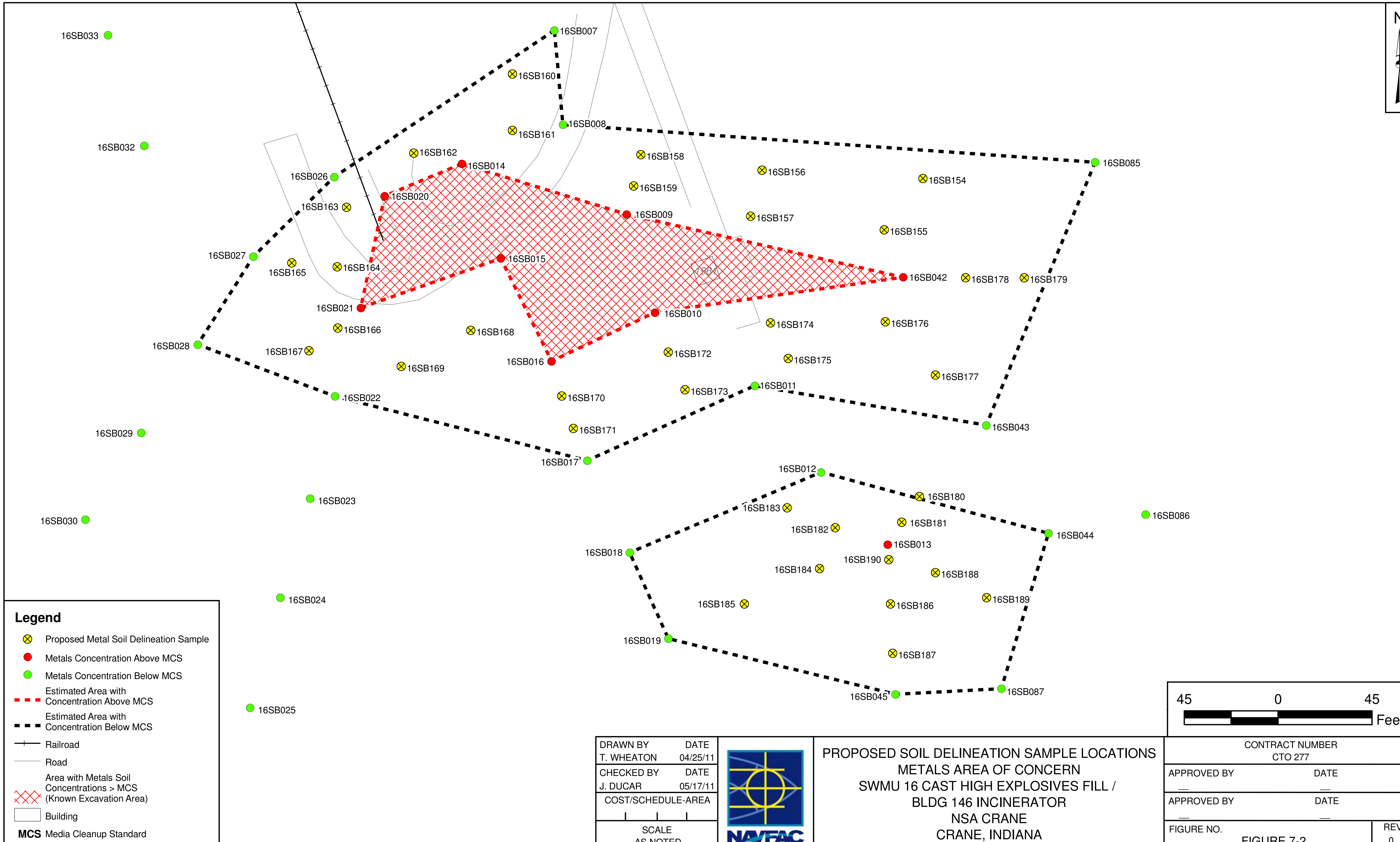

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CHECKED BY J. DUCAR	DATE 05/17/11
COST/SCHEDULE-AREA	
SCALE AS NOTED	

NAVFAC

PROPOSED SOIL DELINEATION SAMPLE LOCATIONS
METALS AREA OF CONCERN
SWMU 16 CAST HIGH EXPLOSIVES FILL /
BLDG 146 INCINERATOR
NSA CRANE
CRANE, INDIANA

CONTRACT NUMBER CTO 277	
APPROVED BY	DATE
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FIGURE NO. FIGURE 7-2	REV 0

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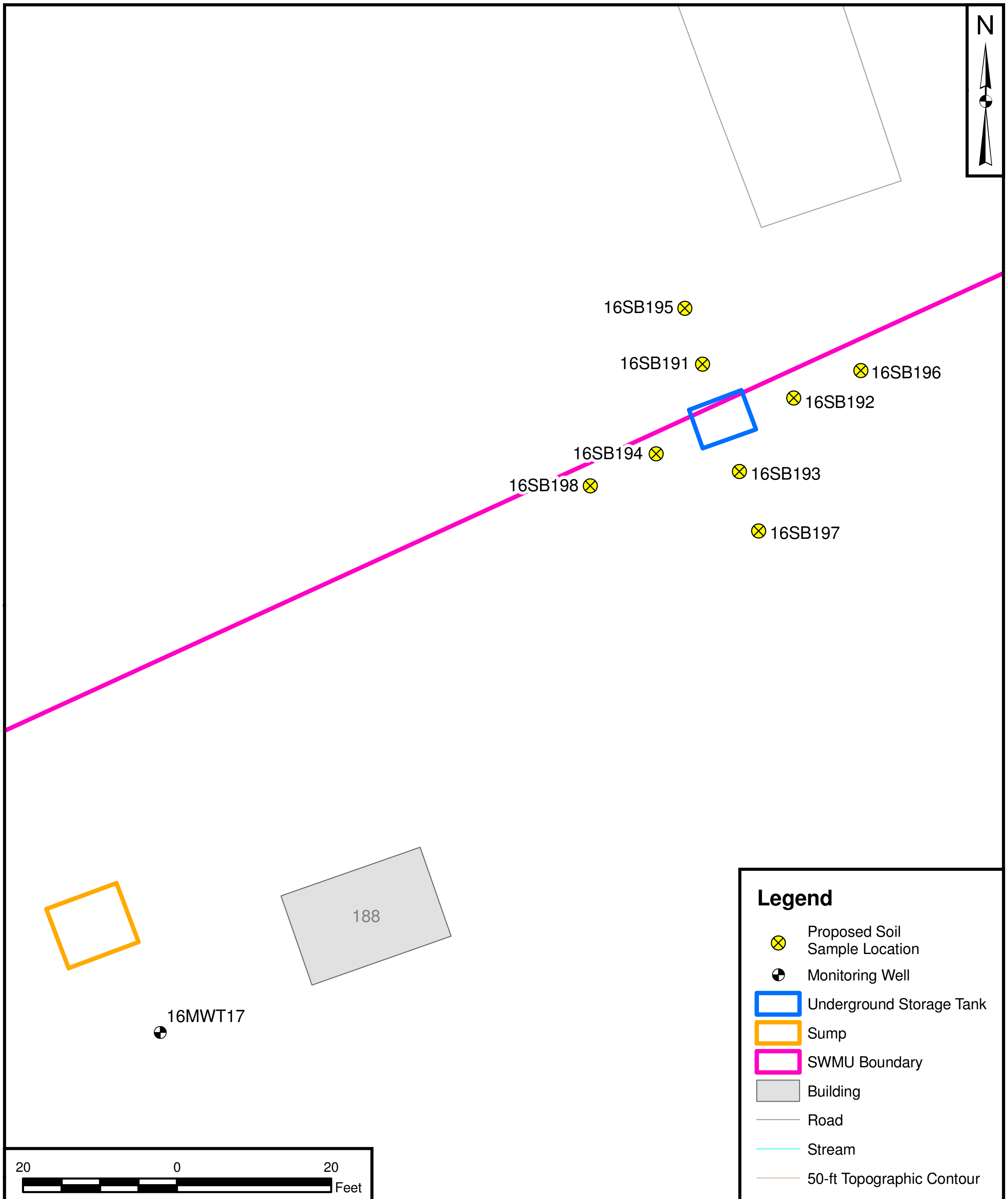

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J. ENGLISH	04/07/11	UST AREA OF CONCERN	____	CTO 277
CHECKED BY	DATE	SWMU 16 CAST HIGH EXPLOSIVES	APPROVED BY ____	DATE ____
J. DUCAR	05/17/11	FILL / BUILDING 146 INCINERATOR		
REVISED BY	DATE	NSA CRANE	APPROVED BY ____	DATE ____
T. WHEATON	05/02/11	CRANE, INDIANA		
SCALE AS NOTED			FIGURE NO. FIGURE 7-3	REV 0

APPENDIX A

SITE-SPECIFIC FIELD STANDARD OPERATING PROCEDURES

STANDARD OPERATING PROCEDURE
SOP-01

SAMPLE LABELING

1.0 PURPOSE

This Standard Operating Procedure (SOP) describes the procedures to be used for labeling sample containers. Sample labels are used to document the sample identification number (ID), date, time, analysis to be performed, preservative, matrix, sampler, and the analytical laboratory. A sample label will be attached to each sample container.

2.0 REQUIRED FIELD FORMS AND EQUIPMENT

Writing utensil (preferably black pen with indelible ink)
Disposable medical-grade gloves (e.g. latex, nitrile)
Sample log sheets
Required sample containers: All sample containers for analysis by fix-based laboratories will be supplied and deemed certified-clean by the laboratory.
Sample labels
Chain-of-custody records
Sealable polyethylene bags
Heavy-duty cooler
Ice

3.0 PROCEDURES

3.1 The following information will be electronically printed on each sample label prior to mobilizing for field activities. Additional “generic” labels will also be printed prior to mobilization to be used for field QC and backups.

- Project Number
- Sample Location ID
- Contract Task Order Number (CTO F277)
- Sample ID

- Sample Matrix
- Preservative
- Analysis to be Performed
- Laboratory Name

3.2 Select the container(s) that are appropriate for a given sample. Select the sample-specific ID label(s), complete date, time, and sampler name, and affix to the sample container(s).

3.3 Fill the appropriate containers with sample material. Securely close the container lids without overtightening.

3.4 Place the sample container in a sealable polyethylene bag and place in a cooler containing ice.

Example of a sample label is attached at the end of this SOP.

4.0 ATTACHMENTS

1. Sample Label

ATTACHMENT 1

SAMPLE LABEL

Tetra Tech NUS, Inc. 661 Andersen Drive Pittsburgh, 15220 (412)921-7090	Project: Location: CTO:	
Sample No:		Matrix:
Date:	Time:	Preserve:
Analysis:		
Sampled by:	Laboratory	

STANDARD OPERATING PROCEDURE

SOP-02

SAMPLE IDENTIFICATION NOMENCLATURE

1.0 PURPOSE

The purpose of this Standard Operating Procedure (SOP) is to establish a consistent sample nomenclature system that will facilitate subsequent data management at the Naval Support Activity (NSA) Crane. The sample nomenclature system has been devised such that the following objectives can be attained.

- Sorting of data by site, location, or matrix
- Maintenance of consistency (field, laboratory, and database sample numbers)
- Accommodation of all project-specific requirements
- Accommodation of laboratory sample number length constraints
- Ease of sample identification

The NSA Crane Environmental Protection Department must approve any deviations from this procedure.

2.0 REQUIRED FIELD FORMS AND EQUIPMENT

Writing utensil (preferably black pen with indelible ink)
Sample tags
Sample container labels

3.0 SAMPLE IDENTIFICATION NOMENCLATURE

3.1 <u>Environmental Samples</u>

All environmental samples will be properly labeled with a sample label affixed to the sample container. Each sample will be assigned a unique sample tracking number.

3.1.1 Environmental Sample Numbering Scheme

The sample tracking number will consist of a four- or five-segment alpha-numeric code that identifies the sample's associated Solid Waste Management Unit (SWMU) number, SWMU; sample type, location, and for soil samples, where applicable, sample depth. For soil samples, the final four tracking numbers will identify the depth in units of feet below ground surface (bgs) at which the sample was collected (rounded to the nearest foot).

The alphanumeric coding to be used is explained in the following diagram and subsequent definitions:

NN	**AA**	**NNN (-F)**	**NNNN (Soils)**
SWMU Number	Matrix	Sample Location Number	Sequential depth interval from freshly exposed surface

Character Type:

A = Alpha

N = Numeric

SWMU Number (NN):

16 = SWMU 16

Matrix Code (AA):

SS = Surface Soil Sample

SB = Subsurface Soil Sample

Location Number (NNN):

The sample location number is the soil sample location. The location number for each sample is listed on the figures and tables in the site-specific work plan.

Depth Interval (NNNN):

This code section will be used for soil samples. The depth code is used to note the depth below ground surface (bgs) at which a soil sample is collected. The first two numbers of the four-number code specify the top interval, and the third and fourth numbers specify the bottom interval of the sample depth. The depths will be noted in whole numbers only; further detail, if needed, will be recorded on the sample log sheet, boring log, logbook, etc.

Depth (for soil, in feet bgs)

0002 = soil collected from 0 to 2 feet bgs

0204 = soil collected from 2 to 4 feet bgs

0810 = soil collected from 8 to 10 feet bgs

3.1.2 Examples of Sample Nomenclature

A soil sample collected from soil boring location 003 at SWMU 16, at a depth of 0- to 2-feet bgs would be labeled as “16SB0030002”.

3.2 Field Quality Assurance/Quality Control (QA/QC) Sample Nomenclature

Field QA/QC samples are described in the UFP-SAP. They will be designated using a different coding system than the one used for regular field samples.

3.2.1 QC Sample Numbering

The QC code will consist of a four-segment alpha-numeric code that identifies the SWMU number, sample QC type, the date the sample was collected, and the number of this type of QC sample collected on that date.

NN	AA	NNNNNN	NN
SWMU Number	QC Type	Date	Sequence Number (per day)

The QC types are identified as:

TB = Trip Blank

3.2.2 Examples of Field QA/QC Sample Nomenclature

The first trip blank associated with samples collected on June 6, 2011 would be designated as “16TB06061101”.

STANDARD OPERATING PROCEDURE
SOP-03

SAMPLE CUSTODY AND DOCUMENTATION OF FIELD ACTIVITIES

1.0 PURPOSE

This Standard Operating Procedure (SOP) establishes the procedures for sample custody and documentation of field sampling and field analyses activities.

2.0 REQUIRED FIELD FORMS AND EQUIPMENT

The following logbooks, forms, labels, and equipment are required.

Writing utensil (preferably black pen with indelible ink)
Site logbook
Field logbook
Sample label
Chain-of-Custody Form
Custody seals
Equipment calibration log
Soil Boring Log
Soil and Sediment Sample Log Sheet

3.0 PROCEDURES

This section describes custody and documentation procedures. All entries made into the logbooks, custody documents, logs, and log sheets described in this SOP must be made in indelible ink (black is preferred). No erasures are permitted. If an incorrect entry is made, the entry will be crossed out with a single strike mark, initialed, and dated.

3.1 Site Logbook

The site logbook is a hard-bound, paginated, controlled-distribution record book in which all major on-site activities are documented. At a minimum, the following activities and events will be recorded (daily) in the site logbook:

- All field personnel present
- Arrival/departure of site visitors
- Arrival/departure of equipment
- Start or completion of sampling activities
- Daily on-site activities performed each day
- Sample pickup information
- Health and safety issues
- Weather conditions

The site logbook is initiated at the start of the first on-site activity (e.g., site visit or initial reconnaissance survey). Entries are to be made for every day that on-site activities take place.

The following information must be recorded on the cover of each site logbook:

- Project name
- Project number
- Book number
- Start date
- End date

Information recorded daily in the site logbook need not be duplicated in other field notebooks but must summarize the contents of these other notebooks and refer to specific page locations in these notebooks for detailed information (where applicable). At the completion of each day's entries, the site logbook must be signed and dated by the Tetra Tech Field Operations Leader (FOL).

3.2 Field Logbooks

The field logbook is a separate, dedicated notebook used by field personnel to document his or her activities in the field. This notebook is hardbound and paginated. At a minimum, the following activities and events will be recorded (daily) in the field logbooks:

- Field personnel for activities in the field logbook
- Arrival/departure of site visitors
- Arrival/departure of equipment

- Start or completion of sampling activities
- Daily on-site activities performed each day
- Sample pickup information
- Health and safety issues
- Weather conditions

Entries are to be made for every day that on-site activities take place.

The following information must be recorded on the cover of each field logbook:

- Project name
- Project number
- Book number
- Start date
- End date

3.3 Sample Labels

Adhesive sample container labels must be completed and applied to every sample container. Information on the label includes the project name, location, sample number, date, time, preservative, analysis, matrix, sampler's initials, and the name of the laboratory performing the analysis. Sample labeling and nomenclature are described in SOP-01 and SOP-02, respectively.

3.4 Chain-of-Custody Form

The Chain-of-Custody Form (COC) is a multi-part form that is initiated as samples are acquired and accompanies a sample (or group of samples) as it is transferred from person to person. This form must accompany any samples collected for laboratory chemical analysis. Each COC will be uniquely numbered. A copy of a blank COC form is attached at the end of this SOP.

The FOL must include the name of the laboratory in the upper right hand corner section to ensure that the samples are forwarded to the correct location. If more than one COC is necessary for any cooler, the FOL will indicate "Page __ of __" on each COC. The original (top) signed copy of the COC will be placed inside a sealable polyethylene bag and taped inside the lid of the shipping cooler. Once the samples are received at the laboratory, the sample custodian checks the contents of the cooler(s) against the enclosed COC(s). Any problems are noted on the enclosed

COC Form (bottle breakage, discrepancies between the sample labels, COC form, etc.) and will be resolved through communication between the laboratory point-of-contact and the Tetra Tech Project Manager (PM). The COC form is signed and retained by the laboratory and becomes part of the sample's corresponding analytical data package.

3.5 Custody Seal

The custody seal is an adhesive-backed label and is part of the chain-of-custody process. Custody seals are used to prevent tampering with samples after they have been collected in the field and sealed in coolers for transit to the laboratory. Custody seals will be signed and dated by the samplers and affixed across the opening edges of each cooler (two seals per cooler on opposite sides) containing environmental samples. The laboratory sample custodian will examine the custody seal for evidence of tampering and will notify the Tetra Tech PM if evidence of tampering is observed.

3.6 Equipment Calibration Log

The Equipment Calibration Log is used to document calibration of measuring equipment used in the field. The Equipment Calibration Log documents that the manufacturer's instructions were followed for calibration of the equipment, including frequency and type of standard or calibration device. An Equipment Calibration Log must be maintained for each electronic measuring device requiring calibration. Entries must be made for each day the equipment is used.

3.7 Sample Log Sheets

The Soil and Sediment Sample Log Sheets and Surface Water Sample Log Sheets are used to document the sampling of soil, sediment, and surface water. Copies of the sample log sheets are attached at the end of the SOP. A sample log sheet will be prepared for each sample collected and submitted for laboratory analysis.

4.0 ATTACHMENTS

1. Chain-of-Custody Record
2. Equipment Calibration Log
3. Soil and Sediment Sample Log
4. Surface Water Sample Log

ATTACHMENT 1
CHAIN-OF-CUSTODY RECORD

CHAIN OF CUSTODY | **NUMBER** | **PAGE ____ OF ______**

PROJECT NO:	SITE NAME:	PROJECT MANAGER AND PHONE NUMBER	LABORATORY NAME AND CONTACT:
SAMPLERS (SIGNATURE)		FIELD OPERATIONS LEADER AND PHONE NUMBER	ADDRESS
		CARRIER/WAYBILL NUMBER	CITY, STATE

STANDARD TAT ☐
RUSH TAT ☐
☐ 24 hr. ☐ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

CONTAINER TYPE PLASTIC (P) or GLASS (G)

PRESERVATIVE USED

DATE YEAR ___	TIME	SAMPLE ID	MATRIX	GRAB (G) COMP (C)	No. OF CONTAINERS	TYPE OF ANALYSIS								COMMENTS

1. RELINQUISHED BY	DATE	TIME	1. RECEIVED BY	DATE	TIME
2. RELINQUISHED BY	DATE	TIME	2. RECEIVED BY	DATE	TIME
3. RELINQUISHED BY	DATE	TIME	3. RECEIVED BY	DATE	TIME
COMMENTS					

DISTRIBUTION: WHITE (ACCOMPANIES SAMPLE) YELLOW (FIELD COPY) PINK (FILE COPY)

3/99
FORM NO. TtNUS-001

ATTACHMENT 2
EQUIPMENT CALIBRATION LOG

EQUIPMENT CALIBRATION LOG

PROJECT NAME : ____________________

SITE NAME: ____________________

PROJECT No.: ____________________

INSTRUMENT NAME/MODEL: ____________________

MANUFACTURER: ____________________

SERIAL NUMBER: ____________________

Date of Calibration	Instrument I.D. Number	Person Performing Calibration	Instrument Settings		Instrument Readings		Calibration Standard (Lot No.)	Remarks and Comments
			Pre-calibration	Post-calibration	Pre-calibration	Post-calibration		

ATTACHMENT 3

SOIL AND SEDIMENT SAMPLE LOG SHEET

SOIL & SEDIMENT SAMPLE LOG SHEET

Page___ of ___

Project Site Name: ________________
Project No.: ________________

[] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other: ________________
[] QA Sample Type: ________________

Sample ID No.: ________________
Sample Location: ________________
Sampled By: ________________
C.O.C. No.: ________________

Type of Sample:
[] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

	Depth Interval	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date:			
Time:			
Method:			
Monitor Reading (ppm):			

COMPOSITE SAMPLE DATA:

Date:	Time	Depth Interval	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings				
(Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

ATTACHMENT 4

SURFACE WATER SAMPLE LOG SHEET

Tetra Tech NUS, Inc. **SURFACE WATER SAMPLE LOG SHEET**

Page___ of ___

Project Site Name: ______________________
Project No.: ______________________

Sample ID No.: ______________
Sample Location: ______________
Sampled By: ______________
C.O.C. No.: ______________

[] Stream
[] Spring
[] Pond
[] Lake
[] Other: ______________________
[] QA Sample Type: ______________________

Type of Sample:
[] Low Concentration
[] High Concentration

SAMPLING DATA:

	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP
Date:								
Time:	Visual	Standard	mS/cm	Degrees C	NTU	mg/l	%	mV
Depth:								
Method:								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

STANDARD OPERATING PROCEDURE

SOP-04

SAMPLE PRESERVATION, PACKAGING, AND SHIPPING

1.0 PURPOSE

This Standard Operating Procedure (SOP) describes the procedures for sample preservation, packaging, and shipping to be used in handling soil, sediment, and aqueous samples.

2.0 REQUIRED FIELD FORMS AND EQUIPMENT

Shipping labels
Custody seals
Chain-of-custody (COC) form(s)
Sample containers with preservatives: All sample containers for analysis by fixed-base laboratories will be supplied, with preservatives added (if required) and deemed certified clean by the laboratory.
Sample shipping containers (coolers): All sample shipping containers are supplied by the laboratory.
Packaging material: Bubble wrap, sealable polyethylene bags, strapping tape, etc.

3.0 PROCEDURES FOR SAMPLE PRESERVATION, PACKAGING, AND SHIPPING

3.1 The laboratory provides sample containers with preservative already included (as required) for the analytical parameter for which the sample is to be analyzed. All samples will be held, stored, and shipped at 4 degrees Celsius (°C). This will be accomplished through refrigeration (used to hold samples prior to shipment) and/or ice.

3.2 The sampler shall maintain custody of the samples until the samples are relinquished to another custodian or to the common carrier.

3.3 Check that each sample container is properly labeled, the container lid is securely fastened, and the container is sealed in a polyethylene bag.

3.4 If the container is glass, place the sample container into a bubble-out shipping bag and seal the bag using the self-sealing, pressure sensitive tape supplied with the bag.

3.5 Inspect the insulated shipping cooler. Check for any cracks, holes, broken handles, etc. If the cooler has a drain plug, make certain it is sealed shut, both inside and outside of the cooler. If the cooler is questionable for shipping, the cooler must be discarded.

3.6 Line the cooler with large plastic bag, and line the bottom of the cooler with a layer of bubble wrap. Place the sample containers into the shipping cooler in an upright position (containers will be upright, with the exception of any 40-milliliter vials). Continue filling the cooler with ice until the cooler is nearly full and the movement of the sample containers is limited.

3.7 Wrap the large plastic bag closed and secure with tape.

3.8 Place the original (top) signed copy of the COC form inside a sealable polyethylene bag. Tape the bag to the inside of the lid of the shipping cooler.

3.9 Close the cooler and seal the cooler with approximately four wraps of strapping tape at each end of the cooler. Prior to wrapping the last wrap of strapping tape, apply a signed and dated custody seal to each side of the cooler (one per side). Cover the custody seal with the last wrap of tape. This will provide a tamper evident custody seal system for the sample shipment.

3.10 Affix shipping labels to each of the coolers, ensuring all of the shipping information is filled in properly. Overnight (e.g., FedEx Priority Overnight) courier services will be used for all sample shipments.

3.11 All samples will be shipped to the laboratory no more than 72 hours after collection. Under no circumstances should sample hold times be exceeded.

STANDARD OPERATING PROCEDURE

SOP-05

BOREHOLE ADVANCEMENT AND SOIL CORING USING DIRECT-PUSH TECHNOLOGY AND HAND AUGER TECHNIQUES

1.0 PURPOSE

This Standard Operating Procedure (SOP) describes the procedures for collecting surface and subsurface soil cores from unconsolidated overburden materials using direct-push technology (DPT) and hand augering techniques at the NSA Crane facility.

2.0 REQUIRED FIELD FORMS AND EQUIPMENT

Cut-resistant non-latex Impermeable Gloves
Cotton gloves
Disposable medical-grade gloves (e.g., latex, nitrile)
Writing utensil
Boring log sheets: A copy of this form is included in SOP-06.
DPT Equipment:

- **DPT Probe Rig**
- **Geoprobe® Macrocore Sampler or equivalent**
- **Geoprobe® Sampling Kit or equivalent**
- **Clear acetate liners:** one new liner for each soil core

Hand Auger Equipment:

- **Stainless Steel Auger Buckets**
- **Stainless Steel Extension Rods**
- **Cross Handle**

Required decontamination materials (see SOP-08)
Bentonite pellets

3.0 BOREHOLE ADVANCEMENT AND SOIL SAMPLING USING A DPT

DPT will be employed to collect soil cores. DPT refers to sampling tools and sensors that are driven directly into the ground without the use of conventional rotary drilling equipment. DPT typically utilizes hydraulic pressure and/or percussion hammers to advance the sampling tools. Geoprobe® is a manufacturer of a hydraulically powered, percussion/probing machine utilizing DPT to collect subsurface environmental samples.

3.1 Clear the area to be sampled of any surface debris (herbaceous vegetation, twigs, rocks, litter, etc.).

3.2 Place a new clear acetate liner in the detachable sampling core barrel, and attach the coring device to the DPT rig.

3.3 Drive the sampler (lined with an acetate sleeve) into the ground to the desired depth using hydraulic pressure.

3.4 Retract the sampler from the borehole, and remove the acetate liner and the soil core from the sampler barrel.

3.5 Attach the metal trough from the sampling kit firmly to a suitable surface.

3.6 Place the acetate liner containing the soil core in the trough.

3.7 While wearing cut-resistant gloves (constructed of non-latex over cotton), cut the acetate liner through its entire length using the double-bladed knife that accompanies the Geoprobe® Sampling Kit. Then remove the strip of acetate from the trough to gain access to the collected soils. **CAUTION:** Do not attempt to cut the acetate liner while holding it in your hand.

3.8 Log the soil core on the Boring Log Sheet (see SOP-06).

3.9 Place the soil sample aliquots in the appropriate containers, as described in SOP-07.

3.10 Repeat steps 3.2 through 3.11 for the next depth intervals.

3.11 Upon completion of the boring, backfill the borehole with the soil from the location. If insufficient soil is available to fill the hole to the ground surface, then bentonite pellets mixed with the soil will be used to backfill the hole. If soil materials from the boring are suspected of being contaminated, the soil boring will be backfilled with bentonite pellets up to the ground surface.

3.12 Decontaminate all soil sampling equipment in accordance with SOP-08 before collecting the next sample.

4.0 BOREHOLE ADVANCEMENT AND SOIL SAMPLING USING A HAND AUGER

Hand augers may be employed to collect soil cores when the area is inaccessible by the drill rig. A hand augering system generally consists of a variety of all stainless steel bucket bits (i.e. cylinders 6-1/2" long and 2-3/4", 3-1/4", and 4" in diameter), a series of extension rods (available in 2', 3', 4' and 5' lengths), a cross handle. A larger diameter bucket bit is commonly used to bore a hole to the desired sampling depth and then withdrawn. In turn, the larger diameter bit is replaced with a smaller diameter bit, lowered down the hole, and slowly turned into the soil at the completion depth or refusal. The apparatus is then withdrawn and the soil sample collected.

The hand auger can be used in a wide variety of soil conditions. It can be used to sample soil, both from the surface, or to depths in excess of 12 feet. However, the presence of rock layers and the collapse of the borehole normally contribute to its limiting factors.

4.1 Attach a properly decontaminated bucket bit into a clean extension rod and further attach the cross handle to the extension rod.

4.2 Clear the area to be sampled of any surface debris (vegetation, twigs, rocks, litter, etc.)

4.3 Begin augering to the desired sample depth (periodically removing accumulated soils from the bucket bit into a properly decontaminated stainless steel mixing bowl), and add additional rod extensions as necessary. Discard the top of the core (approximately 1"), which represents any loose material collected by the bucket bit before penetrating the sample material.

4.4 Log the soil core each time soil is placed into the mixing bowl on the Boring Log Sheet (see SOP-06). Also, note (in a field notebook or on standardized data sheets) the changes in the color, texture or odor of the soil.

4.5 After reaching the desired sample depth, slowly and carefully withdraw the apparatus from the borehole.

4.6 Utilizing a properly decontaminated stainless steel trowel or disposable trowel, remove the last of the sample material from the bucket bit and place into the properly decontaminated stainless steel mixing bowl and thoroughly homogenize the inorganic sample material prior to filling the sample containers, as described in SOP-07.

4.7 Excess soil core materials will be returned to the hole and tamped. If insufficient soil is available to fill the hole to the ground surface, then bentonite pellets mixed with the soil will be used to backfill the hole.

4.8 Decontaminate all soil sampling equipment in accordance with SOP-08 before collecting the next sample.

STANDARD OPERATING PROCEDURE
SOP-06

SOIL SAMPLE LOGGING

1.0 PURPOSE

This Standard Operating Procedure (SOP) describes the standard procedures and technical guidance on the logging of soil samples.

2.0 FIELD FORMS AND EQUIPMENT

Knife
Ruler (marked in tenths and hundredths of feet)
Boring Log: An example of this form is attached.
Writing utensil (preferably black pen with indelible ink)

3.0 RESPONSIBILITIES

A field geologist or engineer is responsible for supervising all activities and assuring that each soil sample is properly and completely logged.

4.0 PROCEDURES FOR SAMPLE LOGGING

To maintain a consistent classification of soil, it is imperative that the field geologist understands and accurately uses the field classification system described in this SOP. This identification is based on visual examination and manual tests.

4.1 USCS Classification

Soils are to be classified according to the Unified Soil Classification System (USCS). This method of classification is detailed in Figure 1 (attached to this SOP). This method of classification identifies soil types on the basis of grain size and cohesiveness.

Fine-grained soils, or fines, are smaller than the No. 200 sieve and are of two types: silt (M) and clay (C). Some classification systems define size ranges for these soil particles, but for field classification purposes, they are identified by their respective behaviors. Organic material (O) is a common component of soil but has no distinguishable size range; it is recognized by its composition. The careful study of the USCS will aid in developing the competence and consistency necessary for the classification of soils.

Coarse-grained soils will be divided into categories: rock fragments, sand, or gravel. The terms "sand" (S) and "gravel" (G) not only refer to the size of the soil particles but also to their depositional history. To insure accuracy in description, the term "rock fragments" will be used to indicate angular granular materials resulting from the breakup of rock. The sharp edges that are typically observed indicate little or no transport from their source area; and therefore, the term provides additional information in reconstructing the depositional environment of the soils encountered. When the term "rock fragments" is used, it will be followed by a size designation such as "(1/4-inch or ½-inch diameter)" or "coarse-sand size" either immediately after the entry or in the remarks column. The USCS classification would not be affected by this variation in terms.

4.2 Color

Soil colors will be described utilizing a single color descriptor preceded, when necessary, by a modifier to denote variations in shade or color mixtures. A soil could therefore be referred to as "gray" or "light gray" or "blue-gray." Because color can be utilized in correlating units between sampling locations, it is important for color descriptions to be consistent from one boring to another.

Colors must be described while the sample is still moist. Soil samples will be broken or split vertically to describe colors. Samplers tend to smear the sample surface, creating color variations between the sample interior and exterior.

The term "mottled" will be used to indicate soils irregularly marked with spots of different colors. Mottling in soils usually indicates poor aeration and lack of good drainage.

4.3 Relative Density and Consistency

To classify the relative density and/or consistency of a soil, the geologist is to first identify the soil type. Granular soils contain predominantly sands and gravels. They are non-cohesive (particles do not adhere well when compressed). Finer-grained soils (silts and clays) are cohesive (particles will adhere together when compressed).

Granular soils are given the USCS classifications GW, GP, GM, SW, SP, SM, GC, or SC (see Figure 1).

The consistency of cohesive soils is determined by performing field tests and identifying the consistency as shown in the following table.

CONSISTENCY FOR COHESIVE SOILS

Consistency	Standard Penetration Resistance (Blows per Foot)	Unconfined Compressive Strength (Tons/Sq. Foot by pocket penetration)	Field Identification
Very soft	0 to 2	Less than 0.25	Easily penetrated several inches by fist.
Soft	2 to 4	0.25 to 0.50	Easily penetrated several inches by thumb.
Medium stiff	4 to 8	0.50 to 1.0	Can be penetrated several inches by thumb with moderate effort.
Stiff	8 to 15	1.0 to 2.0	Readily indented by thumb but penetrated only with great effort.
Very stiff	15 to 30	2.0 to 4.0	Readily indented by thumbnail.
Hard	Over 30	More than 4.0	Indented with difficulty by thumbnail.

Cohesive soils are given the USCS classifications ML, MH, CL, CH, OL, or OH (see Figure 1).

The consistency of cohesive soils is determined by hand by determining the resistance to penetration by the thumb. The thumb determination methods are conducted on a selected sample of the soil, preferably the lowest 0.5-foot of the sample. The sample will be broken in half and the thumb pushed into the end of the sample to determine the consistency. Do not determine consistency by attempting to penetrate a rock fragment. If the sample is decomposed rock, it is classified as a soft decomposed rock rather than a hard soil. One of the other methods will be used in conjunction with it. The designations used to describe the consistency of cohesive soils are shown in the above-listed table.

4.4 Weight Percentages

In nature, soils are consist of particles of varying size and shape and are combinations of the various grain types. The following terms are useful in the description of soil:

Terms of Identifying Proportion of the Component	Defining Range of Percentages by Weight
Trace	0 - 10 percent
Some	11 - 30 percent

Adjective form of the soil type (e.g., sandy)	31 - 50 percent

Examples:

- Silty fine sand: 50 to 69 percent fine sand, 31 to 50 percent silt.
- Medium to coarse sand, some silt: 70 to 80 percent medium to coarse sand, 11 to 30 percent silt.
- Fine sandy silt, trace clay: 50 to 68 percent silt, 31 to 49 percent fine sand, 1 to 10 percent clay.
- Clayey silt, some coarse sand: 70 to 89 percent clayey silt, 11 to 30 percent coarse sand.

4.5 Moisture

Moisture content is estimated in the field according to four categories: dry, moist, wet, and saturated. In dry soil, there appears to be little or no water. Saturated samples obviously have all the water they can hold. Moist and wet classifications are somewhat subjective and often are determined by the individual's judgment. A suggested parameter for this would be calling a soil wet if rolling it in the gloved hand or on a porous surface liberates water (i.e., dirties or muddies the surface). Whatever method is adopted for describing moisture, it is important that the method used by an individual remains consistent throughout an entire field activity.

4.6 Classification of Soil Grain Size for Chemical Analysis

To determine the gross grain size classification (e.g., clay, silt, and sand) from the USCS classification described above, the following table will be used.

Gross Soil Grain Size Classification	USCS Abbreviation	Description
Clay	CL	inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
	CH	inorganic clays of high plasticity, fat clays.
	OH	organic clays of medium to high plasticity, organic silts.
Silt	ML	inorganic silts and very fine sands, rock four, silty or clayey fine sands with slight plasticity.
	OL	organic silts and organic silty clays of low plasticity.
	MH	inorganic silts, micaceous or diatomaceous fine sand or silty soils.
Sand	SW	well graded sands, gravelly sands, little or no fines.
	SP	poorly graded sands, gravelly sands, little or no fines.
	SM	silty sands, sand-silt mixtures.
	SC	clayey sands, sand-clay mixtures.

4.7 Summary of Soil Classification

In summary, soils will be classified in a similar manner by each geologist/engineer at a project site. The hierarchy of classification is as follows:

- Density and/or consistency
- Color
- Plasticity (optional)
- Soil types
- Moisture content
- Other distinguishing features
- Grain size
- Depositional environment

5.0 ATTACHMENTS

1. Figure 1 - Unified Soil Classification System
2. Boring Log

ATTACHMENT 1

FIGURE 1 - UNIFIED SOIL CLASSIFICATION SYSTEM

Unified Soil Classification System

Coarse Grained Soils (more than half of soil > No. 200 sieve)	Gravels (More than half of coarse fraction > no. 4 sieve size)		GW	Well graded gravels or gravel-sand mixtures, little or no fines
			GP	Poorly graded gravels or gravel-sand mixtures, little or no fines
			GM	Sandy gravels, gravel-sand-silt mixtures
			GC	Clayey gravels, gravel-sand-silt mixtures
	Sands (More than half of coarse fraction < no. 4 sieve size)		SW	Well graded sands or gravelly sands, little or no fines
			SP	Poorly graded sands or gravelly sands, little or no fines
			SM	Silty sands, sand-silt mixtures
			SC	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity
Fine Grained Soils (more than half of soil < No. 200 sieve)	Silts and Clays LL = < 50		ML	Inorganic silts and very fine sands, rock flour, silty fine sands or clayey silts with slight plasticity
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, lean clays
			OL	Organic silts and organic silty clays of low plasticity
	Silts and Clays LL = > 50		MH	Inorganic silts, micaceous or diatomaceous fine sand or silty soils, elastic silts
			CH	Inorganic silts of high plasticity, fat clays
			OH	Organic clays of high plasticity, organic silty clays, organic silts
Highly Organic Soils			Pt	Peat and other highly organic soils

Grain Size Chart

Classification	Range of Grain Sizes: U.S. Standard Sieve Size	Range of Grain Sizes: Grain Size In Millimeters
Boulders	Above 12"	Above 305
Cobbles	12" to 3"	305 to 76.2
Gravel	3" to No. 4	76.2 to 7.76
coarse	3" to 3/4"	76.2 to 4.76
fine	3/4" to No.4	19.1 to 4.76
Sand	No. 4 to No. 200	4.76 to 0.074
coarse	No.4 to No. 10	4.76 to 2.00
medium	No. 10 to No. 40	2.00 to 0.420
fine	No. 40 to No. 200	0.420 to 0.074
Silt and Clay	Below No. 200	Below 0.074

Relative Density (SPT)

SANDS AND GRAVELS	BLOWS/FOOT
VERY LOOSE	0 – 4
LOOSE	4 – 10
MEDIUM DENSE	10 – 30
DENSE	32 – 50
VERY DENSE	OVER 50

Consistency (SPT)

SILTS AND CLAYS	BLOWS/FOOT
VERY SOFT	0 – 2
SOFT	2 – 4
MEDIUM STIFF	4 – 8
STIFF	8 – 16
VERY STIFF	16 – 22
HARD	OVER 32

ATTACHMENT 2

BORING LOG

Tetra Tech NUS, Inc.

BORING LOG

Page ___ of ___

PROJECT NAME: ____________________ BORING No.: ____________________
PROJECT NUMBER: ____________________ DATE: ____________________
DRILLING COMPANY: ____________________ GEOLOGIST: ____________________
DRILLING RIG: ____________________ DRILLER: ____________________

					MATERIAL DESCRIPTION					PID/FID Reading (ppm)			
Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	Soil Density/ Consistency or Rock Hardness	Color	Material Classification	U S C S *	Remarks	Sample	Sampler BZ	Borehole**	Driller BZ**

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks: ____

Drilling Area Background (ppm): [ ]

Converted to Well: Yes _______ No _______ Well I.D. #: ____________________

STANDARD OPERATING PROCEDURE
SOP-07

SURFACE AND SUBSURFACE SOIL SAMPLING

1.0 PURPOSE

This Standard Operating Procedure (SOP) describes the procedures to be used for surface and subsurface soil sampling using direct-push technology (DPT) or hand augers during field activities at NSA Crane SWMU 16. This procedure also describes the collection of samples for analysis of volatile organic compounds (VOCs), including total petroleum hydrocarbon (TPH)-gasoline range organics (GRO), in accordance with USEPA Method 5035A and the use of field screening [i.e., photoionization detector (PID)] to select the subsurface soil intervals for VOC sampling.

2.0 REQUIRED FIELD FORMS AND EQUIPMENT

Writing utensil (preferably black pen with indelible ink)
Disposable medical-grade gloves (i.e. latex, nitrile)
Boring log
Soil sample logsheets
Stainless-steel mixing bowls
Stainless-steel trowel or soup spoon
Terra Core® samplers
Disposable trowels
Photoionization Detector (PID) or similar
Required sample containers: All sample containers including shipping coolers for analysis by fixed-base laboratories will be supplied and certified clean by the laboratory.
Required decontamination materials
Chain-of-custody records
Required personnel protective equipment (PPE)
Wooden stakes or pin flags
Survey tape
Marking Paint
Sealable polyethylene bags
Heavy-duty cooler

Ice

Razor knife

DPT Probe Rig and sampling equipment

Sample labels

3.0 COLLECTION OF SOIL SAMPLES FOR VOLATILE ORGANIC COMPOUNDS (VOCs) USING DPT

When soil cores are collected using DPT, such as Geoprobe®, 4-foot soil intervals will be collected in clear acetate tubes, which can be extracted from the Geoprobe® macrocore upon retrieval at the surface (see SOP-08). Note: A surface soil sample is collected from the 0- to 2-foot depth. Additional subsurface soil samples each consist of 2-foot core segments. All samples collected for VOC analyses will be collected with the use of a DPT, to the extent possible. The samples must be collected as soon as possible after the macrocores have been brought to the surface. Sample collection should be completed within 3 to 5 minutes after the soil has been exposed to the atmosphere to minimize volatilization. The following presents the sample collection tasks.

3.1 Establish a suitable work area near the point of sample collection. Prior to sample collection, ensure all necessary equipment (e.g., PID) is operating properly and calibrated (if necessary).

3.2 Slit the macrocore acetate liner lengthwise with an appropriate cutting tool (e.g., razor knife), remove a section of the liner, and expose the length of the soil interval (see SOP-05). Note: the rate of macrocore collection should not proceed faster than the field samplers can process the samples in order to prevent the macrocores from being exposed to the atmosphere for a long period of time to prevent potential volatilization of the soil within the macrocore.

Scan the soil core interval with a PID, slowly moving the intake nozzle along the length of the core where the acetate liner has been slit open. Note on the boring log the range of PID readings that are detected and the specific location(s) along the sample interval where above-background readings are encountered. If elevated volatile organics are measured via the PID, collect the VOC samples from the specific interval where the highest PID reading is measured. If no above-background PID readings are measured, then the VOC sample will be collected from a specific interval where visual signs of contamination (staining, etc.) are observed. If no above-background PID reading is measured, and no discoloration or odor in the soil core indicates potential contamination, then collect the VOC sample from near the center of the core at the bottom of the interval. The VOC sample will be collected using an appropriate sample collection device (i.e., Terra Core® sampler).

3.3 The 0- to 2-foot core interval will be collected as a surface soil sample. Determine where in this core interval the highest PID reading was encountered. Soil samples collected for volatile organics will be obtained directly from soil cores using Terra Core® samplers for each VOC and TPH-GRO sample.

The Terra Core® sampling method is as follows:

Step 1

Have ready a 40mL glass VOA vial containing the appropriate preservative (i.e., methanol, sodium bisulfate, or deionized water). With the plunger seated in the handle, push the Terra Core® into freshly exposed soil until the sample chamber is filled. A filled chamber will deliver approximately 5 grams of soil. Note: The ratio of soil to methanol must be 1:1; consequently, if the vials contain 5 ml of methanol, the soil aliquot must be around 5 g,

Step 2

Wipe all soil or debris from the outside of the Terra Core® sampler. The soil plug should be flush with the mouth of the sampler. Remove any excess soil that extends beyond the mouth of the sampler.

Step 3

Rotate the plunger that was seated in the handle top 90 degrees until it is aligned with the slots in the body. Place the mouth of the sampler into the 40mL VOA vial containing the appropriate preservative and extrude the sample by pushing the plunger down. Quickly place the lid back on the 40mL VOA vial. Note: When capping the 40mL VOA vial, be sure to remove any soil or debris from the top and/or threads of the vial.

In addition, each VOC soil sample will include a separate aliquot to be used for percent moisture analysis. The percent moisture sample will be collected by filling one 2 oz container with sample representing the same location where the 40 mL VOC vial sample was collected. Every effort will be made to obtain the percent moisture soil aliquot as close as possible to the location where the VOC sample aliquots were collected.

Step 4

Place the three sample vials in the sample holder that comes with the sample kit and fill in appropriate information, including sample identification, date, time, and other information on the label. Place the sample vial holders and moisture sample in a plastic bag and place the tag on the bag, identifying the sample identification and other necessary information (see SOP-01). No additional labels will be added to the pre-weighed sample vials received from the laboratory, Be sure that laboratory-provided information (i.e., vial tare weight and/or identification bar codes) are exposed and legible on the vials.

Once the samples are properly labeled and bagged, place the samples into the cooler containing ice and a trip blank. The cooler should be kept at ≤ 6°C and shipped to the analytical laboratory for preservation or extraction within 48 hours. Fill in the required information on the Soil Sample Log Sheet (attached at the end of this SOP) and fill in the required information on the Chain-of-Custody (COC) Form.

4.0 COLLECTION OF NON-VOC SOIL SAMPLE ALIQUOTS USING DPT

4.1 After the VOC sample has been collected for the soil interval of interest (see Section 3.0 above), the remainder of the remainder of the soil interval will be composited and used to fill the sample containers. Any surface debris (e.g., herbaceous vegetation, twigs, rocks, litter, etc.) should first be removed from the top of the surface soil core. For other core intervals, the top 2 inches of each core should be discarded because it often contains material scraped from the side of the borehole and not fresh material from the bottom of the borehole.

4.2 Slide the remaining core material out of the acetate liner and into a clean, decontaminated stainless-steel mixing bowl. Mix the soil thoroughly with a stainless-steel spoon and remove gravel, large pebbles, and other coarse materials. Fill the required sample containers in the following order:

- Container for other organic analyses (i.e., total petroleum hydrocarbons-diesel range organics [TPH-DRO]),
- Container for metals,
- Container for moisture.

4.3 Complete all required information on the sample labels and secure the label to the sample container (see SOP-01).

4.4 Place the sample container in a ziplock plastic bag and seal closed. Place the bag in a cooler containing ice and cool to ≤ 6°C.

4.5 Record the required information on the Soil Sample Log Sheet and the COC Record form.

5.0 COLLECTION OF SOIL SAMPLES USING A HAND AUGER

5.1 Utilizing a properly decontaminated stainless steel trowel or disposable trowel, remove the sample material from the hand auger bucket bit, and remove gravel, large pebbles, and other coarse materials. Scan the soil core interval with a PID. Note on the boring log the range of PID readings that are detected and the specific location(s) along the sample interval where above-background readings are encountered.

5.2 If collecting VOC samples, collect the sample aliquot for VOCs directly from an open-sided hand auger bucket prior to disturbing the material, following the applicable VOC sampling procedures stated in Sections 3.0 through 3.3 above.

5.3 Collect sample aliquots for non-VOCs by sliding the remaining core material out of the hand auger bucket and into a clean, decontaminated stainless-steel mixing bowl. Mix the soil thoroughly with a stainless-steel spoon and remove gravel, large pebbles, and other coarse materials.

5.4 Fill the required sample containers in the following order:

- Container for other organic analyses (i.e., TPH-DRO)
- Container for metals

5.5 Complete all required information on the sample labels and secure the label to the sample container (see SOP-01).

5.6 Place the sample container in a ziplock plastic bag and seal closed. Place the bag in a cooler containing ice and cool to ≤ 6°C.

5.7 Record the required information on the Soil Sample Log Sheet and the COC Record form.

6.0 PACKAGING AND SHIPPING OF SAMPLES

Samples will be packaged and shipped according to SOP-04.

7.0 ATTACHMENTS

1. Soil and Sediment Sample Log Sheet

ATTACHMENT 1

SOIL AND SEDIMENT SAMPLE LOG SHEET

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Page___ of ___

Project Site Name: ____________________
Project No.: ____________________

[] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other: ____________________
[] QA Sample Type: ____________________

Sample ID No.: ____________________
Sample Location: ____________________
Sampled By: ____________________
C.O.C. No.: ____________________

Type of Sample:
[] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

	Depth Interval	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date:			
Time:			
Method:			
Monitor Reading (ppm):			

COMPOSITE SAMPLE DATA:

	Time	Depth Interval	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date:				
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

STANDARD OPERATING PROCEDURE

SOP-08

DECONTAMINATION OF FIELD SAMPLING EQUIPMENT

1.0 PURPOSE

This Standard Operating Procedure (SOP) establishes the procedures to be followed when decontaminating non-dedicated field sampling equipment during the field investigations.

2.0 REQUIRED FIELD FORMS AND EQUIPMENT

Writing utensil (preferably black pen with indelible ink)
Non-latex rubber or plastic gloves
Cotton gloves
Field logbook
Potable water
Deionized water
Isoproponal (optional)
Liqui-Nox® or Alconox® detergent
Brushes, spray bottles, paper towels, etc.
Container to collect and transport decontamination fluids

3.0 DECONTAMINATION PROCEDURES

3.1 Don non-latex and/or cotton gloves and decontaminate sampling equipment (in accordance with the following steps) prior to field sampling and between samples.

3.2 Rinse the equipment with potable water. Rinsing may be conducted by spraying with water from a spray bottle or by dipping. Collect the potable water rinsate into a container.

3.3 Wash the equipment with a solution of Liqui-Nox® or Aloconox® detergent. Prepare the detergent wash solution in accordance with the instructions on the detergent container. Collect the wash solution into a container. Use brushes or sprays as appropriate for the equipment. If oily residue has accumulated on the sampling equipment, remove the residue with an isopropanol wash and repeat the detergent wash.

3.4 Rinse the equipment with potable water. Rinsing may be conducted by spraying with water from a spray bottle or by dipping. Collect the potable water rinsate into a container.

3.5 Rinse the equipment with deionized water. Rinsing may be conducted by spraying with water from a spray bottle or by dipping. Collect the deionized water rinsate into a container.

3.6 Remove excess water by air drying and shaking or by wiping with paper towels as necessary.

3.7 Document decontamination by recording it in the field logbook.

3.8 Containerized decontamination solutions will be managed in accordance with the procedures described in SOP-10.

STANDARD OPERATING PROCEDURE

SOP-09

GLOBAL POSITIONING SYSTEM

1.0 PURPOSE

The purpose of this Standard Operating Procedure (SOP) is to provide the field personnel with basic instructions for operating a handheld Global Positioning System (GPS) unit allowing them to set GPS parameters in the receiver, record GPS positions on the field device, and update existing Geographic Information System (GIS) data. This SOP is specific to GIS quality data collection for Trimble®-specific hardware and software.

If possible, the Trimble® GeoXM™ or GeoXH™ operators manual should be downloaded onto the operator's personal computer for reference before or while in the field. The manual can be downloaded at http://trl.trimble.com/docushare/dsweb/Get/Document-311749/TerraSyncReferenceManual.pdf

Unless the operator is proficient in the setup and operation of the GPS unit, the Project Manager (or designee) should have the GPS unit shipped to the project-specific contact listed below in the Pittsburgh, Pennsylvania, office at least five working days prior to field mobilization so project-specific shape files, data points, background images, and correct coordinate systems can be uploaded into the unit.

Tetra Tech NUS, Inc.
Attn: John Wright
661 Anderson Drive, Bldg #7
Pittsburgh, PA 15220

2.0 REQUIRED EQUIPMENT

The following hardware and software should be utilized for locating and establishing GPS points in the field:

2.1 Required GPS Hardware

- Hand-held GPS unit capable of sub-meter accuracy (i.e. Trimble® GeoXM™ or Trimble® GeoXH™). This includes the docking cradle, A/C adapter, stylus, and USB cable for data transfer.

Optional Accessories:

- External antenna
- Range pole
- Hardware clamp (for mounting GPS unit to range pole)
- GeoBeacon

- Writing utensil (preferably black pen with indelible ink)
- Non-metallic pin flags for temporary marking of positions

2.2 Required GPS Software

The following software is required to transfer data from the handheld GPS unit to a personal computer:

- Trimble® TerraSync version 2.6 or later (pre-loaded onto GPS unit from vendor)

- Microsoft® ActiveSync® version 4.5 or later. Download to personal computer from: http://www.microsoft.com/windowsmobile/en-us/downloads/microsoft/activesync-download.mspx

- Trimble® Data Transfer Utility (freeware version 2.1 or later). Download to personal computer from: http://www.trimble.com/datatransfer.shtml

3.0 START-UP PROCEDURES

Prior to utilizing the GPS in the field, ensure the unit is fully charged. The unit may come charged from the vendor, but an overnight charge is recommended prior to fieldwork.

The Geo-series GPS units require a docking cradle for both charging and data transfer. The Geo-series GPS unit is docked in the cradle by first inserting the domed end in the top of the cradle, then gently seating the contact end into the latch. The power charger is then connected to the cradle at the back end using the twist-lock connector. Attach a USB cable as needed between the cradle (B end) and the laptop/PC (A end).

It is recommended that the user also be familiar and check various Windows Mobile settings. One critical setting is the Power Options. The backlight should be set as needed to conserve power when not in use.

Start Up:

1) Power on the GPS unit by pushing the small green button located on the lower right front of the unit.

2) Utilizing the stylus that came with the GPS unit, launch **TerraSync** from the Windows Operating System by tapping on the start icon located in the upper left hand corner of the screen and then tap on **TerraSync** from the drop-down list.

3) If the unit does not default to the Setup screen, tap the Main Menu (uppermost left tab, just below the Windows icon) and select Setup.

4) If the unit was previously shipped to the Pittsburgh office for setup, you can skip directly to Section 4.0. However, to confirm or change settings, continue on to Section 3.1.

3.1 Confirm Setup Settings

Use the Setup section to confirm the TerraSync software settings. To open the Setup section, tap the Main Menu and select Setup.

1) Coordinate System
    a. Tap on the Coordinate System.
    b. Verify the project specs are correct for your specific project by scrolling through the various settings. Edit as needed and then tap OK; otherwise, tap Cancel to return to Setup Menu. **Note:** It is always best to utilize the Cancel tab rather than the OK tab if no changes are made since configurations are easily changed by mistake.
    c. Tap on the Units.
    d. Verify the user preferences are correct for your specific project by scrolling through the various settings. Edit as needed and then tap OK; otherwise, tap Cancel to return to Setup Menu.
    e. Tap Real-time Settings.
    f. Verify the Real-time Settings are correct for your specific project by scrolling through the various settings. Edit as needed and then tap OK; otherwise, tap Cancel to return to Setup Menu.
    g. The GPS unit is now configured correctly for your specific project.

4.0 ANTENNA CONNECTION

1) If a connection has been properly made with the internal antenna, a satellite icon along with the number of usable satellites will appear at the top of the screen next to the battery icon. If no connection is made (e.g.: no satellite icon), tap on the GPS tab to connect antenna.
2) At this point the GPS unit is ready to begin collecting data.

5.0 COLLECTING NEW DATA IN THE FIELD

1) From the Main Menu select Data.
2) From the Sub Menu (located below the Data tab) select New which will bring up the New Data File menu.
3) An auto-generated filename appears and should be edited for your specific project. If the integral keyboard does not appear, tap the small keyboard icon at the bottom of the screen.
4) After entering the file name, tap Create to create the new file.
5) Confirm antenna height if screen appears. Antenna height is the height that the GPS unit will be held from the ground surface (Typically 3 to 4 feet).
6) The Choose Feature screen appears.

5.1 Collecting Features

1) If not already open, the Collect Feature screen can be opened by tapping the Main Menu and selecting Data. The Sub Menu should default to Collect.
2) **Do not begin the data logging process until you are at the specific location for which you intend to log the data.**
3) A known reference or two should be shot at the beginning and at the end of each day in which the GPS unit is being used. This allows for greater accuracy during post-processing of the data.
4) Upon arriving at the specific location, tap on Point_generic as the Feature Name.
5) Tap Create to begin data logging.
6) In the Comment Box enter sample ID or location-specific information.
7) Data logging can be confirmed by viewing the writing pencil icon in the upper part of the screen. Also, the logging counter will begin. As a Rule of Thumb, accumulate a minimum of 20 readings on the counter, per point, as indicated by the logging counter before saving the GPS data.
8) Once the counter has reached a minimum number of counts (i.e. 20), tap on OK to save the data point to the GPS unit. Confirm the feature. All data points are automatically saved within the GPS unit.
9) Repeat steps 2 through 8, giving each data point a unique name or number.

Note: If the small satellite icon or the pencil icon is blinking, this is an indication the GPS unit is not collecting data. A possible problem may be too few satellites. While still in data collection mode, tap on Main Menu in upper left hand corner of the screen and select Status. Skyplot will display as the default showing the number of available satellites. To increase productivity (number of usable satellites) use the stylus to move the pointer on the productivity and precision line to the left. This will decrease precision, but increase productivity. The precision and productivity of the GPS unit can be adjusted as the number of usable satellites changes throughout the day. To determine if GPS is correctly recording data, see Section 5.2.

5.2 Viewing Data or Entering Additional Data Points to the Current File

1) To view the stored data points in the current file, tap on the Main Menu and select Map. Stored data points for that particular file will appear. Use the +/- and <-/-> icons in lower left hand corner of screen to zoom in/out and to manipulate current view.
2) To return to data collection, tap on the Main Menu and select Data. You are now ready to continue to collect additional data points.

5.3 Viewing Data or Entering Data Points from an Existing File

1) To view data points from a previous file, tap on Main Menu and select Data, then select File Manager from the Sub Menu.
4) Highlight the file you want to view and select Map from the Main Menu.
5) To add data points to this file, tap on Main Menu and select Data. Continue to collect additional data points.

6.0 NAVIGATION

This section provides instructions on navigating to saved data points in an existing file within the GPS unit.

1) From the Main Menu select Map.
2) Using the Select tool, pick the point on the map to where you want to navigate.
3) The location you select will have a box placed around the point.
4) From the Options menu, choose the Set Nav Target (aka set navigation target).
5) The location will now have double blue flags indicating this point is you navigation target.
6) From the Main Menu select Navigation.

7) The dial and data on this page will indicate what distance and direction you need to travel to reach the desired target.
8) Follow the navigation guide until you reach the point you select.
9) Repeat as needed for any map point by going back to Step 1.

7.0 PULLING IN A BACKGROUND FILE

This section provides instructions on pulling in a pre-loaded background file. These files are helpful in visualizing your current location.

1) From the Main Menu select Map, then tap on Layers, select the background file from drop down list.
2) Select the project-specific background file from the list of available files.
3) Once the selected background file appears, the operator can manipulate the screen utilizing the +/- and <-/-> functions at the bottom of the screen.
4) In operating mode, the operator's location will show up on the background file as a floating "x".

8.0 DATA TRANSFER

This section provides instructions on how to transfer stored data on the handheld GPS unit to a personal computer. Prior to transferring data from the GPS unit to a computer, Microsoft ActiveSync and Trimble Data Transfer Utility software must be downloaded to the computer from the links provided in Section 2.2 (Required GPS Software). If a leased computer is utilized in which the operator cannot download files, see the Note at the end of Section 8.0.

1) See Attachment A at the end of this SOP for instructions on how to transfer data from the GPS to a personal computer.

Note: If you are unable to properly transfer data from the GPS unit to a personal computer, the unit should be shipped to the project-specific contact listed in Section 1.0 where the data will be transferred and the GPS unit then shipped back to the vendor.

9.0 SHUTTING DOWN

This section provides instruction for properly shutting down the GPS unit.

1) When shutting down the GPS unit for the day, first click on the "X" in the upper right hand corner.

2) You will be prompted to ensure you want to exit TerraSync. Select Yes.
3) Power off the GPS unit by pushing the small green button located on the bottom face of the unit.
4) Place the GPS unit in its cradle to recharge the battery overnight. Ensure the green charge light is visible on the charging cradle.

ATTACHMENT A

How to Transfer Trimble GPS Data between Data Collector and PC
original 11/21/06 (5/1/08 update) – John Wright

Remember – Coordinate System, Datum, and Units are critical!!!

Trimble Data Collection Devices:
Standard rental systems include the Trimble® ProXR/XRS backpack and the newer handheld GeoXT™ or GeoXH™ units. Some of the older backpack system may come with either a RECON "PDA-style" or a TSCe or TSC1 alpha-numeric style data collector.

The software on all of the above units should be Trimble® TerraSync (v 2.53 or higher – current version is 3.20) and to the user should basically look and function similar. The newer units and software versions (which should always be requested when renting) include enhancements for data processing, real-time display functions, and other features.

Data Transfer:
Trimble provides a free transfer utility program to aid in the transfer of GIS and field data. The Data Transfer Utility is a standalone program that will run on a standard office PC or laptop.

To connect a field data collector such as a RECON, GeoXM, GeoXT, GeoXH, or ProXH, you must first have Microsoft® ActiveSync® installed to allow the PC and the data collector to talk to one another. A standard USB cable is also needed to connect the two devices.

A CD or USB drive is provided with the data collector for use in data transfer. If needed, these programs are also available without charge via the web at:

• **Trimble Data Transfer Utility** (v 1.38) program to download the RECON or GeoXH field data to your PC: http://www.trimble.com/datatransfer.shtml

• **ActiveSync** from Microsoft to connect the data collector to the PC. The latest version (v4.5) can be found at: http://www.microsoft.com/windowsmobile/en-us/downloads/microsoft/activesync-download.mspx
(see page 2 for data transfer instructions)

To Transfer Data Collected in the Field:

• Install the Data Transfer and ActiveSync software installed on your PC
• Connect the RECON or GeoXH to your PC via an A/B USB cable (blade end and square end type "HP printer" style)
• ActiveSync should auto-detect the connection and recognize the data collector
• Make sure the data file desired is CLOSED in TerraSync prior to transfer
• Connect via ActiveSync as a guest (not a partnership)
• Run the Trimble Data Transfer Utility program on your PC
• Select "***GIS Datalogger on Windows CE***" or similar selection
• Hit the green connect icon to the right - the far right area should say "***Connected to ....***" if successful
• Select the "***Receive***" data tab (under device)
• Select "***Data***" from file types on the right
• Find the file(s) needed for data transfer. You can sort the data files by clicking on the date/time header
• Select or browse to a C-drive folder you can put this file for emailing
• When the file appears on the list, hit the "***Transfer All***"
• Go to your Outlook or other email, send a message to: John.Wright@tetratech.com (or GIS department)
• Attach the file(s) you downloaded from your C-drive. For each TerraSync data file created you should have a packet of multiple data files. All need to be sent as a group – make sure you attach all files (the number of files may vary – examples include: ssf, obx, obs, gix, giw, gis, gip, gic, dd, and car)

To Transfer GIS Data from PC to the Field Device (must be converted in Pathfinder Office):

• Obtain GIS file(s) desired from GIS Department and have converted to Trimble extension
• Contact John Wright (John.Wright@tetratech.com) if needed for file conversion and upload support
• The GIS file(s) can be quickly converted if requested and sent back to the field user in the needed "Trimble xxx.imp" extension via email – then quickly downloaded from Outlook to your PC for transfer
• Install the Data Transfer and ActiveSync software installed on your PC
• Connect the RECON or GeoXH to your PC via an A/B USB cable (blade end and square end type "HP printer" style)
• ActiveSync should auto-detect the connection and recognize the data collector
• Connect via ActiveSync as a guest (not a partnership)
• Run the Trimble Data Transfer Utility program on your PC
• Select "***GIS Datalogger on Windows CE***" or similar selection
• Hit the green connect icon to the right - the far right area should say "***Connected to ....***" if successful
• Select the "**Send**" data tab (under device)
• Select "**Data**" from file types on the right (you can also send background files)
• Browse to the location of the data on your PC (obtain the file from Pathfinder Office or from the person who converted the data for field use)
• Select the options as appropriate for the name and location of the data file to go on the data collector (usually you can choose main memory or a data storage card)
• When the file(s) appears on the list, hit the "***Transfer All***"
• Run TerraSync on the field device and open the existing data files. Your transferred file should appear (make sure you have selected Main Memory, Default, or Storage Card as appropriate)

STANDARD OPERATING PROCEDURE

SOP-10

MANAGEMENT OF INVESTIGATION-DERIVED WASTE

1.0 PURPOSE

This Standard Operating Procedure (SOP) describes how investigation-derived waste (IDW) will be collected, segregated, classified, and managed during the field investigations at Naval Support Activity (NSA) Crane. The following types of IDW may be generated during this investigation:

- Decontamination solutions
- Personal protective equipment (PPE) and clothing
- Miscellaneous trash and incidental items

2.0 REQUIRED FIELD FORMS AND EQUIPMENT

Health and safety equipment (with PPE)
Bucket (with collected development/purge water)
Decontamination equipment
Field logbook
Writing utensil (preferably black pen with indelible ink)
Plastic sheeting and/or tarps
55-gallon drums with sealable lids
IDW labels for drums
Plastic garbage bags

3.0 PROCEDURES

Management of IDW includes the collection, segregation, temporary storage, classification, final disposal, and documentation of the waste-handling activities if necessary.

3.1 Liquid Wastes

Liquid wastes that may be generated during the site activities include decontamination solutions from sampling equipment. These wastes will be collected and containerized in a central location at NSA Crane for proper disposal.

3.2 Solid Wastes

No solid wastes are expected to be generated during this investigation. Excess soil core/sampling materials will be returned to the hole and tamped. If insufficient soil is available to fill the hole to the ground surface, then bentonite pellets mixed with the soil will be used to backfill the hole and hydrated with potable water. The disposition of this materials will be carried out in a manner such as not to contribute further environmental degradation or pose a threat to public health or safety.

3.3 PPE and Incidental Trash

All PPE wastes and incidental trash materials (e.g., wrapping or packing materials from supply cartons, waste paper, etc.) will be decontaminated (if contaminated), double bagged, securely tied shut, and placed in a designated waste receptacle at NSA Crane.

APPENDIX B

LABORATORY DoD ELAP ACCREDITATION

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

RTI LABORATORIES, INC.
31628 Glendale
Livonia, Michigan 48150
Charles O'Bryan 734-422-8000 ext. 215
cobryan@rtilab.com

ENVIRONMENTAL

Valid To: October 31, 2012 Certificate Number: 0570.03

In recognition of the successful completion of the A2LA evaluation process, (including an assessment of the laboratory's compliance with the NELAC Chapter 5 Standard and the DOD QSM v4.1) accreditation is granted to this laboratory to perform recognized EPA methods using the following testing technologies and in the analyte categories identified below:

Testing Technologies

ICP/MS, Gas Chromatography, Gas Chromatography/Mass Spectrometry, Gravimetry, High Performance Liquid Chromatography, Ion Chromatography, Methylene Blue Active Substances, Microbiology, Misc.- Electronic Probes (pH, O_2), Oxygen Demand, Hazardous Waste Characteristics Tests, Spectrophotometry (Visible), Spectrophotometry (Automated), Titrimetry, Total Organic Carbon, Turbidity

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste
Metals			
Aluminum	EPA 200.8	EPA 200.8/6020	EPA 6020
Antimony	EPA 200.8	EPA 200.8/6020	EPA 6020
Arsenic	EPA 200.8	EPA 200.8/6020	EPA 6020
Barium	EPA 200.8	EPA 200.8/6020	EPA 6020
Beryllium	EPA 200.8	EPA 200.8/6020	EPA 6020
Boron	EPA 200.8	EPA 200.8/6020	EPA 6020
Cadmium	EPA 200.8	EPA 200.8/6020	EPA 6020
Calcium	EPA 200.8	EPA 200.8/6020	EPA 6020
Chromium	EPA 200.8	EPA 200.8/6020	EPA 6020
Cobalt	EPA 200.8	EPA 200.8/6020	EPA 6020
Copper	EPA 200.8	EPA 200.8/6020	EPA 6020
Iron	EPA 200.8	EPA 200.8/6020	EPA 6020
Lead	EPA 200.8	EPA 200.8/6020	EPA 6020
Magnesium	EPA 200.8	EPA 200.8/6020	EPA 6020
Manganese	EPA 200.8	EPA 200.8/6020	EPA 6020
Mercury	EPA 245.1	EPA 245.1/1631/7470A	EPA 7471A
Molybdenum	EPA 200.8	EPA 200.8/6020	EPA 6020
Nickel	EPA 200.8	EPA 200.8/6020	EPA 6020

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste
Potassium	EPA 200.8	EPA 200.8/6020	EPA 6020
Selenium	EPA 200.8	EPA 200.8/6020	EPA 6020
Silicon	EPA 200.8	EPA 200.8/6020	EPA 6020
Silver	EPA 200.8	EPA 200.8/6020	EPA 6020
Sodium	EPA 200.8	EPA 200.8/6020	EPA 6020
Thallium	EPA 200.8	EPA 200.8/6020	EPA 6020
Tin	EPA 200.8	EPA 200.8/6020	EPA 6020
Titanium	EPA 200.8	EPA 200.8/6020	EPA 6020
Uranium	EPA 200.8	EPA 200.8/6020	EPA 6020
Vanadium	EPA 200.8	EPA 200.8/6020	EPA 6020
Zinc	EPA 200.8	EPA 200.8/6020	EPA 6020
Preparation Methods	- - - - - - - - - -	EPA 3020	EPA 3050
Nutrients			
Ammonia (as N)	SM4500 NH3-D	SM4500 NH3-D	- - - - - - - - - -
Kjeldahl Nitrogen	EPA 351.2	EPA 351.2	- - - - - - - - - -
Nitrate (as N)	EPA 300.0 SM 4500-NO3 E SM 4500-NO3 H	EPA 300.0/9056 SM 4500-NO3 E SM 4500-NO3 H	EPA 9056
Nitrate-nitrite (as N)	EPA 300.0	EPA 300.0/9056	EPA 9056
Nitrite (as N)	EPA 300.0 SM 4500-NO2 B	EPA 300.0/9056 SM 4500-NO2 B	EPA 9056
Orthophosphate (as P)	EPA 300.0/ SM4500 P F	EPA 300.0/9056 SM4500 P-F	EPA 9056
Total Phosphorus	SM4500 P-F	SM4500 P-F	- - - - - - - - - -
Demands			
Biochemical Oxygen Demand	SM5210 B	SM5210 B	- - - - - - - - - -
Carbonaceous BOD	SM5210 B	SM5210 B	- - - - - - - - - -
Chemical Oxygen Demand	EPA 410.4	EPA 410.4	- - - - - - - - - -
Total Organic Carbon	SM5310 B	SM5310 B	EPA 9060
Wet Chemistry			
Alkalinity	SM2320 B	EPA 310.1	- - - - - - - - - -
Chloride	EPA 300.0	EPA 300.0/9056	EPA 9056
Chlorine (residual)	SM4500-Cl I	SM4500 Cl-I	
Cyanide	SM4500 CN-E	SM4500 CN-E EPA 9012B	EPA 9012B
Available Cyanide	ASTM D6888	ASTM D6888	- - - - - - - - - -
Fluoride	EPA 300.0	EPA 300.0/9056	EPA 9056
Hardness	EPA 200.8	EPA 200.8/6020	EPA 6020
Hexavalent Chromium	- - - - - - - - - -	SM 4500 CR-B EPA 7196	EPA 7196/3060
pH	SM4500-H$^+$ B	SM4500-H$^+$ B EPA 9040C/9041A	EPA 9045C
Oil and Grease	EPA 1664A	EPA 1664A	EPA 9071B
Phenols	EPA 420.1	EPA 420.1/9065	EPA 9065
Total Residue	SM2540 B	SM2540 B	- - - - - - - - - -

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste
Filterable Residue	SM2540 C	SM2540 C	- - - - - - - - - -
Nonfilterable Residue	SM2540 D	SM2540 D	- - - - - - - - - -
Specific Conductance	SM2510 B	SM2510 B	- - - - - - - - - -
Sulfate	EPA 300.0	EPA 300.0/9056	EPA 9056
Surfactants	SM5540 C	SM5540 C	- - - - - - - - - -
Turbidity	SM2130 B	SM2130 B	- - - - - - - - - -
Purgeable Organics (volatiles)			
Acetone	- - - - - - - - - -	EPA 624/8260B	EPA 8260B
Acetonitrile	- - - - - - - - - -	EPA 624/8260B	EPA 8260B
Acrolein	- - - - - - - - - -	EPA 624/8260B	EPA 8260B
Acrylamide	- - - - - - - - - -	EPA 624/8260B	- - - - - - - - - -
Acrylonitrile	- - - - - - - - - -	EPA 624/8260B	EPA 8260B
Benzene	- - - - - - - - - -	EPA 624/8260B	EPA 8260B
Bromobenzene	- - - - - - - - - -	EPA 624/8260B	EPA 8260B
Bromodichloromethane	- - - - - - - - - -	EPA 624/8260B	EPA 8260B
Bromoform	- - - - - - - - - -	EPA 624/8260B	EPA 8260B
Bromomethane	- - - - - - - - - -	EPA 624/8260B	EPA 8260B
2-Butanone	- - - - - - - - - -	EPA 624/8260B	EPA 8260B
n-Buytlbenzene	- - - - - - - - - -	EPA 624/8260B	EPA 8260B
sec-Butylbenzene	- - - - - - - - - -	EPA 624/8260B	EPA 8260B
tert-Butylbenzene	- - - - - - - - - -	EPA 624/8260B	EPA 8260B
Carbon Disulfide	- - - - - - - - - -	EPA 624/8260B	EPA 8260B
Carbon Tetrachloride	- - - - - - - - - -	EPA 624/8260B	EPA 8260B
Chlorobenzene	- - - - - - - - - -	EPA 624/8260B	EPA 8260B
Chloroethane	- - - - - - - - - -	EPA 624/8260B	EPA 8260B
2-Chloroethyl Vinyl Ether	- - - - - - - - - -	EPA 624/8260B	EPA 8260B
Chloroform	- - - - - - - - - -	EPA 624/8260B	EPA 8260B
Chloromethane	- - - - - - - - - -	EPA 624/8260B	EPA 8260B
Chlorotoluene	- - - - - - - - - -	EPA 624/8260B	EPA 8260B
Dibromochloromethane	- - - - - - - - - -	EPA 624/8260B	EPA 8260B
1,2-Dibromo-3-Chloropropane (DBCP)	- - - - - - - - - -	EPA 624/8260B	EPA 8260B
Dibromomethane	- - - - - - - - - -	EPA 624/8260B	EPA 8260B
1,2 Dibromomethane (EDB)	- - - - - - - - - -	EPA 624/8260B	EPA 8260B
1,4-Dichloro-2-butane	- - - - - - - - - -	EPA 624/8260B	EPA 8260B
1,2-Dichlorobenzene	- - - - - - - - - -	EPA 624/8260B	EPA 8260B
1,3-Dichlorobenzene	- - - - - - - - - -	EPA 624/8260B	EPA 8260B
1,4-Dichlorobenzene	- - - - - - - - - -	EPA 624/8260B	EPA 8260B
Dichlorodifluoromethane	- - - - - - - - - -	EPA 624/8260B	EPA 8260B
1,1-Dichloroethane	- - - - - - - - - -	EPA 624/8260B	EPA 8260B
1,2-Dichloroethane	- - - - - - - - - -	EPA 624/8260B	EPA 8260B
1,1-Dichloroethene	- - - - - - - - - -	EPA 624/8260B	EPA 8260B
cis-1,2-Dichloroethene	- - - - - - - - - -	EPA 624/8260B	EPA 8260B
trans-1,2-Dichloroethene	- - - - - - - - - -	EPA 624/8260B	EPA 8260B
1,2-Dichloropropane	- - - - - - - - - -	EPA 624/8260B	EPA 8260B

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste
1,3-Dichloropropane	- - - - - - - - - -	EPA 624/8260B	EPA 8260B
2,2-Dichloropropane	- - - - - - - - - -	EPA 624/8260B	EPA 8260B
1,1-Dichloropropene	- - - - - - - - - -	EPA 624/8260B	EPA 8260B
cis-1,3-Dichloropropene	- - - - - - - - - -	EPA 624/8260B	EPA 8260B
trans-1,3-Dichloropropene	- - - - - - - - - -	EPA 624/8260B	EPA 8260B
Diethyl Ether	- - - - - - - - - -	EPA 624/8260B	EPA 8260B
Ethanol	- - - - - - - - - -	EPA 624/8260B	EPA 8260B
Ethyl Benzene	- - - - - - - - - -	EPA 624/8260B	EPA 8260B
Ethyl Methacrylate	- - - - - - - - - -	EPA 624/8260B	EPA 8260B
Gas Range Organics (GRO)	- - - - - - - - - -	EPA 8015B	EPA 8015B
2-Hexanone	- - - - - - - - - -	EPA 624/8260B	EPA 8260B
Hexachlorobutadiene	- - - - - - - - - -	EPA 624/8260B	EPA 8260B
Isopropylbenzene	- - - - - - - - - -	EPA 624/8260B	EPA 8260B
1,4-Isopropyltoluene	- - - - - - - - - -	EPA 624/8260B	EPA 8260B
Iodomethane	- - - - - - - - - -	EPA 624/8260B	EPA 8260B
Methylene Chloride	- - - - - - - - - -	EPA 624/8260B	EPA 8260B
Methyl Ethyle Ketone (MEK)	- - - - - - - - - -	EPA 624/8260B	EPA 8260B
Methyl Isobutyl Ketone	- - - - - - - - - -	EPA 624/8260B	EPA 8260B
4-Methyl-2-pentanone	- - - - - - - - - -	EPA 624/8260B	EPA 8260B
Naphthalene	- - - - - - - - - -	EPA 624/8260B	EPA 8260B
n-Propylbenzene	- - - - - - - - - -	EPA 624/8260B	EPA 8260B
Polynuclear Aromatic Hydrocarbons (PAHs)	- - - - - - - - - -	EPA 625/8270D	EPA 8270D
Styrene	- - - - - - - - - -	EPA 624/8260B	EPA 8260B
1,1,1,2-Tetrachloroethane	- - - - - - - - - -	EPA 624/8260B	EPA 8260B
1,1,2,2-Tetrachloroethane	- - - - - - - - - -	EPA 624/8260B	EPA 8260B
Tetrachloroethene	- - - - - - - - - -	EPA 624/8260B	EPA 8260B
Toluene	- - - - - - - - - -	EPA 624/8260B	EPA 8260B
Total Petroleum Hydrocarbons (TPH)	- - - - - - - - - -	EPA 1664A	EPA 1664A
1,1,1-Trichloroethane	- - - - - - - - - -	EPA 624/8260B	EPA 8260B
1,1,2-Trichloroethane	- - - - - - - - - -	EPA 624/8260B	EPA 8260B
Trichloroethene	- - - - - - - - - -	EPA 624/8260B	EPA 8260B
Trichlorofluoromethane	- - - - - - - - - -	EPA 624/8260B	EPA 8260B
1,2,3-Trichloropropane	- - - - - - - - - -	EPA 624/8260B	EPA 8260B
1,2,4-Trimethylbenzene	- - - - - - - - - -	EPA 624/8260B	EPA 8260B
1,3,5-Trimethylbenzene	- - - - - - - - - -	EPA 624/8260B	EPA 8260B
Trihalomethanes	- - - - - - - - - -	EPA 624/8260B	EPA 8260B
Vinyl Chloride	- - - - - - - - - -	EPA 624/8260B	EPA 8260B
Xylenes, Total	- - - - - - - - - -	EPA 624/8260B	EPA 8260B
1,2-Xylene	- - - - - - - - - -	EPA 624/8260B	EPA 8260B
1,3-Xylene	- - - - - - - - - -	EPA 624/8260B	EPA 8260B
1,4-Xylene	- - - - - - - - - -	EPA 624/8260B	EPA 8260B
Carbon Dioxide	RSKSOP-175	RSKSOP-175	- - - - - - - - - -
Ethane	RSKSOP-175	RSKSOP-175	- - - - - - - - - -
Ethylene	RSKSOP-175	RSKSOP-175	- - - - - - - - - -

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Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste
Methane	RSKSOP-175	RSKSOP-175	- - - - - - - - - -
Preparation Methods	- - - - - - - - - -	EPA 5030B	EPA 5035
Extractable Organics (semivolatiles)			
Acenaphthene	- - - - - - - - - -	EPA 625/8270D	EPA 8270D
Acenaphthylene	- - - - - - - - - -	EPA 625/8270D	EPA 8270D
Acetophenone	- - - - - - - - - -	EPA 625/8270D	EPA 8270D
4-Aminobiphenyl	- - - - - - - - - -	EPA 625/8270D	EPA 8270D
Aniline	- - - - - - - - - -	EPA 625/8270D	EPA 8270D
Anthracene	- - - - - - - - - -	EPA 625/8270D	EPA 8270D
Benzidine	- - - - - - - - - -	EPA 625/8270D	EPA 8270D
Benzoic Acid	- - - - - - - - - -	EPA 625/8270D	EPA 8270D
Benzo (a) Anthracene	- - - - - - - - - -	EPA 625/8270D	EPA 8270D
Benzo (b) Fluoranthene	- - - - - - - - - -	EPA 625/8270D	EPA 8270D
Benzo (k) Fluoranthene	- - - - - - - - - -	EPA 625/8270D	EPA 8270D
Benzo (ghi) Fluoranthene	- - - - - - - - - -	EPA 625/8270D	EPA 8270D
Benzo (a) Pyrene	- - - - - - - - - -	EPA 625/8270D	EPA 8270D
Benzyl Alcohol	- - - - - - - - - -	EPA 625/8270D	EPA 8270D
Benzyl Chloride	- - - - - - - - - -	EPA 625/8270D	EPA 8270D
Bis (2-chloroethoxy) Methane	- - - - - - - - - -	EPA 625/8270D	EPA 8270D
Bis (2-chloroethoxy) Ether	- - - - - - - - - -	EPA 625/8270D	EPA 8270D
Bis (2-chloroisopropyl) Ether	- - - - - - - - - -	EPA 625/8270D	EPA 8270D
Bis (2-ethylhexyl) Phthalate	- - - - - - - - - -	EPA 625/8270D	EPA 8270D
4-Bromophenylphenyl) Phthalate	- - - - - - - - - -	EPA 625/8270D	EPA 8270D
Butyl Benzyl Phthalate	- - - - - - - - - -	EPA 625/8270D	EPA 8270D
2-sec-Butyl-4,6-dinitrophenol	- - - - - - - - - -	EPA 625/8270D	EPA 8270D
4-Chloroaniline	- - - - - - - - - -	EPA 625/8270D	EPA 8270D
4-Chloro-3-methylphenol	- - - - - - - - - -	EPA 625/8270D	EPA 8270D
1-Chloronaphthalene	- - - - - - - - - -	EPA 625/8270D	EPA 8270D
2-Chloronaphthalene	- - - - - - - - - -	EPA 625/8270D	EPA 8270D
2-Chlorophenol	- - - - - - - - - -	EPA 625/8270D	EPA 8270D
4-Chlorophenyl Phenyl Ether	- - - - - - - - - -	EPA 625/8270D	EPA 8270D
Chrysene	- - - - - - - - - -	EPA 625/8270D	EPA 8270D
Cresols	- - - - - - - - - -	EPA 625/8270D	EPA 8270D
2-Cyclohexyl-4,6-dinitrophenol	- - - - - - - - - -	EPA 625/8270D	EPA 8270D
Dibenzo (a,h) Anthracene	- - - - - - - - - -	EPA 625/8270D	EPA 8270D
Dibenzofuran	- - - - - - - - - -	EPA 625/8270D	EPA 8270D
1,2-Dichlorobenzene	- - - - - - - - - -	EPA 625/8270D	EPA 8270D
1,3-Dichlorobenzene	- - - - - - - - - -	EPA 625/8270D	EPA 8270D
1,4-Dichlorobenzene	- - - - - - - - - -	EPA 625/8270D	EPA 8270D

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste
3,3'-Dichlorobenzidine	- - - - - - - - - -	EPA 625/8270D	EPA 8270D
2,4-Dichlorophenol	- - - - - - - - - -	EPA 625/8270D	EPA 8270D
2,6-Dichlorophenol	- - - - - - - - - -	EPA 625/8270D	EPA 8270D
Diethyl phthalate	- - - - - - - - - -	EPA 625/8270D	EPA 8270D
2,4-Dimethylphenol	- - - - - - - - - -	EPA 625/8270D	EPA 8270D
Dimethyl Phthalate	- - - - - - - - - -	EPA 625/8270D	EPA 8270D
Di-n-butyl Phthalate	- - - - - - - - - -	EPA 625/8270D	EPA 8270D
Di-n-octyl Phthalate	- - - - - - - - - -	EPA 625/8270D	EPA 8270D
Dinitrobenzene	- - - - - - - - - -	EPA 625/8270D	EPA 8270D
2,4-Dinitrophenol	- - - - - - - - - -	EPA 625/8270D	EPA 8270D
2,4-Dinitrotoluene	- - - - - - - - - -	EPA 625/8270D	EPA 8270D
2,6-Dinitrotoluene	- - - - - - - - - -	EPA 625/8270D	EPA 8270D
Diphenylamine	- - - - - - - - - -	EPA 625/8270D	EPA 8270D
DRO	- - - - - - - - - -	EPA 8015B	EPA 8015B
Fluoroanthene	- - - - - - - - - -	EPA 625/8270D	EPA 8270D
Fluorene	- - - - - - - - - -	EPA 625/8270D	EPA 8270D
Hexachlorobenzene	- - - - - - - - - -	EPA 625/8270D	EPA 8270D
Hexachlorobutadiene	- - - - - - - - - -	EPA 625/8270D	EPA 8270D
Hexachlorocyclopentadiene	- - - - - - - - - -	EPA 625/8270D	EPA 8270D
Hexachloroethane	- - - - - - - - - -	EPA 625/8270D	EPA 8270D
Indeno (1,2,3-cd) Pyrene	- - - - - - - - - -	EPA 625/8270D	EPA 8270D
Isophorone	- - - - - - - - - -	EPA 625/8270D	EPA 8270D
2-Methyl-4,6-Dinitrophenol	- - - - - - - - - -	EPA 625/8270D	EPA 8270D
2-Methylphenol	- - - - - - - - - -	EPA 625/8270D	EPA 8270D
4-Methylphenol	- - - - - - - - - -	EPA 625/8270D	EPA 8270D
Naphthalene	- - - - - - - - - -	EPA 625/8270D	EPA 8270D
2-Nitroaniline	- - - - - - - - - -	EPA 625/8270D	EPA 8270D
3-Nitroaniline	- - - - - - - - - -	EPA 625/8270D	EPA 8270D
4-Nitroaniline	- - - - - - - - - -	EPA 625/8270D	EPA 8270D
Nitrobenzene	- - - - - - - - - -	EPA 625/8270D	EPA 8270D
2-Nitrophenol	- - - - - - - - - -	EPA 625/8270D	EPA 8270D
4-Nitrophenol	- - - - - - - - - -	EPA 625/8270D	EPA 8270D
N-Nitrosodi-n-propylamine	- - - - - - - - - -	EPA 625/8270D	EPA 8270D
N-Nitrosodiphenylamine	- - - - - - - - - -	EPA 625/8270D	EPA 8270D
2,2-oxybis(1-chloropropane)	- - - - - - - - - -	EPA 625/8270D	EPA 8270D
Pentachlorobenzene	- - - - - - - - - -	EPA 625/8270D	EPA 8270D
Pentachloronitobenzene	- - - - - - - - - -	EPA 625/8270D	EPA 8270D
Pentachlorophenol	- - - - - - - - - -	EPA 625/8270D	EPA 8270D
Phenanthrene	- - - - - - - - - -	EPA 625/8270D	EPA 8270D
Phenol	- - - - - - - - - -	EPA 625/8270D	EPA 8270D
Pyrene	- - - - - - - - - -	EPA 625/8270D	EPA 8270D
Styrene	- - - - - - - - - -	EPA 625/8270D	EPA 8270D
Tetrachlorobenzenes	- - - - - - - - - -	EPA 625/8270D	EPA 8270D
1,2,4,5-Tetrachlorobenzene	- - - - - - - - - -	EPA 625/8270D	EPA 8270D
2,3,4,5-Tetrachlorophenol	- - - - - - - - - -	EPA 625/8270D	EPA 8270D
2,4,6-Tribromophenol	- - - - - - - - - -	EPA 625/8270D	EPA 8270D

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Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste
1,2,4-Trichlorobenzene	- - - - - - - - - -	EPA 625/8270D	EPA 8270D
2,4,5-Trichlorophenol	- - - - - - - - - -	EPA 625/8270D	EPA 8270D
2,4,6-Trichlorophenol	- - - - - - - - - -	EPA 625/8270D	EPA 8270D
Preparation Methods	- - - - - - - - - -	EPA 3510	EPA 3545/3550
Pesticides/Herbicides/PCBs			
Aldrin	- - - - - - - - - -	EPA 608/8081A	EPA 8081A
Atrazine	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Azinophos Methyl	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
alpha-BHC	- - - - - - - - - -	EPA 608/8081A	EPA 8081A
beta-BHC	- - - - - - - - - -	EPA 608/8081A	EPA 8081A
delta-BHC	- - - - - - - - - -	EPA 608/8081A	EPA 8081A
gamma-BHC	- - - - - - - - - -	EPA 608/8081A	EPA 8081A
Bolstar	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Chlordane (technical)	- - - - - - - - - -	EPA 608/8081A	EPA 8081A
Chloropyrifos	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
2,4-D	- - - - - - - - - -	EPA 8151A	EPA 8151A
Dalapon	- - - - - - - - - -	EPA 8151A	EPA 8151A
2,4-DB	- - - - - - - - - -	EPA 8151A	EPA 8151A
4,4'-DDD	- - - - - - - - - -	EPA 608/8081A	EPA 8081A
4,4'-DDE	- - - - - - - - - -	EPA 608/8081A	EPA 8081A
4,4',-DDT	- - - - - - - - - -	EPA 608/8081A	EPA 8081A
Demeton-O	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Demeton-S	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Diazinon	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Dicamba	- - - - - - - - - -	EPA 8151A	EPA 8151A
Dichlofention	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Dichlorvos	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Dichloroprop	- - - - - - - - - -	EPA 8151A -	EPA 8151A
Dieldrin	- - - - - - - - - -	EPA 608/8081A	EPA 8081A
Dinoseb	- - - - - - - - - -	EPA 8151A	EPA 8151A
Disulfoton	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Endosulfan I	- - - - - - - - - -	EPA 608/8081A	EPA 8081A
Endosulfan II	- - - - - - - - - -	EPA 608/8081A	EPA 8081A
Endonsulfan Sulfate	- - - - - - - - - -	EPA 608/8081A	EPA 8081A
Endrin	- - - - - - - - - -	EPA 608/8081A	EPA 8081A
Endrin Aldehyde	- - - - - - - - - -	EPA 608/8081A	EPA 8081A
Endrin Ketone	- - - - - - - - - -	EPA 608/8081A	EPA 8081A
Ethion	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Ethoprop	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
Heptachlor	- - - - - - - - - -	EPA 608/8081A	EPA 8081A
Heptachlor Epoxide	- - - - - - - - - -	EPA 608/8081A	EPA 8081A
Malathion	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -
MCPA	- - - - - - - - - -	EPA 8151A	EPA 8151A
MCPP	- - - - - - - - - -	EPA 8151A	EPA 8151A
Methoxychlor	- - - - - - - - - -	EPA 608/8081A	EPA 8081A
PCB-1016 (Arochlor)	- - - - - - - - - -	EPA 608/8082	EPA 8082
PCB-1221	- - - - - - - - - -	EPA 608/8082	EPA 8082

Parameter/Analyte	Potable Water	Nonpotable Water	Solid Hazardous Waste
PCB-1232	- - - - - - - - - -	EPA 608/8082	EPA 8082
PCB-1242	- - - - - - - - - -	EPA 608/8082	EPA 8082
PCB-1248	- - - - - - - - - -	EPA 608/8082	EPA 8082
PCB-1254	- - - - - - - - - -	EPA 608/8082	EPA 8082
PCB-1260	- - - - - - - - - -	EPA 608/8082	EPA 8082
PCB-1262	- - - - - - - - - -	EPA 608/8082	EPA 8082
PCB-1268	- - - - - - - - - -	EPA 608/8082	EPA 8082
2,4,5-T	- - - - - - - - - -	EPA 8151A	EPA 8151A
2,4,5-TP	- - - - - - - - - -	EPA 8151A	EPA 8151A
Toxaphene	- - - - - - - - - -	EPA 608/8081a	EPA 8081A
Conductivity	- - - - - - - - - -	EPA 9050A	- - - - - - - - - -
Corrosivity	- - - - - - - - - -	EPA 9040C	SW 846 Ch7/9040C/9045C
Explosives	- - - - - - - - - -	EPA 8330B	EPA 8330B
Ignatibility	- - - - - - - - - -	- - - - - - - - - -	EPA 1010/1030
Paint Filter Liquids Test	- - - - - - - - - -	- - - - - - - - - -	EPA 9095A
Nitroglycerine	- - - - - - - - - -	EPA 8330B	EPA 8330B
Synthetic Precipitation Leaching Procedure (SPLP)	- - - - - - - - - -	- - - - - - - - - -	EPA 1312
Toxicity Characteristic Leaching Procedure	- - - - - - - - - -	- - - - - - - - - -	EPA 1311
Preparation Methods	- - - - - - - - - -	EPA 3510	EPA 3545/3550

Analyte	Air
1,1,1-Trichloroethane	EPA TO-15
1,1,2,2-Tetrachloroethane	EPA TO-15
1,1,2-Trichloro-1,2,2-trifluoroethane	EPA TO-15
1,1,2-Trichloroethane	EPA TO-15
1,1-Dichloroethane	EPA TO-15
1,1-Dichloroethene	EPA TO-15
1,2,4-Trichlorobenzene	EPA TO-15
1,2,4-Trimethylbenzene	EPA TO-15
1,2-Dibromoethane	EPA TO-15
1,2-Dichlorobenzene	EPA TO-15
1,2-Dichloroethane	EPA TO-15
1,2-Dichloropropane	EPA TO-15
1,3,5-Trimethylbenzene	EPA TO-15
1,3-Butadiene	EPA TO-15
1,3-Dichlorobenzene	EPA TO-15
1,4-Dichlorobenzene	EPA TO-15
1,4-Dioxane	EPA TO-15
2-Butanone	EPA TO-15
2-Hexanone	EPA TO-15
2-Propanol	EPA TO-15
4-Methyl-2-pentanone	EPA TO-15
Acetone	EPA TO-15

Analyte	Air
Benzene	EPA TO-15
Benzyl chloride	EPA TO-15
Bromodichloromethane	EPA TO-15
Bromoform	EPA TO-15
Bromomethane	EPA TO-15
Carbon disulfide	EPA TO-15
Carbon tetrachloride	EPA TO-15
Chlorobenzene	EPA TO-15
Chlorodibromomethane	EPA TO-15
Chloroethane	EPA TO-15
Chloroform	EPA TO-15
Chloromethane	EPA TO-15
cis-1,2-Dichloroethene	EPA TO-15
cis-1,3-dichloropropene	EPA TO-15
Cyclohexane	EPA TO-15
Dichlorodifluoromethane	EPA TO-15
Ethanol	EPA TO-15
Ethyl acetate	EPA TO-15
Ethylbenzene	EPA TO-15
Heptane	EPA TO-15
Hexachlorobutadiene	EPA TO-15
m,p-Xylene	EPA TO-15
Methylene chloride	EPA TO-15
n-Hexane	EPA TO-15
o-Xylene	EPA TO-15
Propylene	EPA TO-15
Styrene	EPA TO-15
tert-Butyl Methyl Ether	EPA TO-15
Tetrachloroethene	EPA TO-15
Tetrahydrofuran	EPA TO-15
Toluene	EPA TO-15
trans-1,3-dichloropropene	EPA TO-15
Trichloroethene	EPA TO-15
Trichlorofluoromethane	EPA TO-15
Vinyl acetate	EPA TO-15
Vinyl chloride	EPA TO-15
Xylenes, Total	EPA TO-15
PCBs as Aroclors	
Aroclor 1016	EPA TO-4/EPA TO-10
Aroclor 1221	EPA TO-4/EPA TO-10
Aroclor 1232	EPA TO-4/EPA TO-10
Aroclor 1242	EPA TO-4/EPA TO-10
Aroclor 1248	EPA TO-4/EPA TO-10
Aroclor 1254	EPA TO-4/EPA TO-10
Aroclor 1260	EPA TO-4/EPA TO-10
Total PCBs	EPA TO-4/EPA TO-10
Pesticides	
4,4´-DDD	EPA TO-4/EPA TO-10

Analyte	Air
4,4´-DDE	EPA TO-4/EPA TO-10
4,4´-DDT	EPA TO-4/EPA TO-10
Aldrin	EPA TO-4/EPA TO-10
alpha-BHC	EPA TO-4/EPA TO-10
beta-BHC	EPA TO-4/EPA TO-10
Chlordane, total	EPA TO-4/EPA TO-10
Dieldrin	EPA TO-4/EPA TO-10
Endosulfan I	EPA TO-4/EPA TO-10
Endosulfan II	EPA TO-4/EPA TO-10
Endosulfan sulfate	EPA TO-4/EPA TO-10
Endrin	EPA TO-4/EPA TO-10
Endrin aldehyde	EPA TO-4/EPA TO-10
Endrin ketone	EPA TO-4/EPA TO-10
gamma-BHC	EPA TO-4/EPA TO-10
Heptachlor	EPA TO-4/EPA TO-10
Heptachlor epoxide	EPA TO-4/EPA TO-10
Hexachlorobenzene	EPA TO-4/EPA TO-10
Methoxychlor	EPA TO-4/EPA TO-10
Total PCBs	EPA TO-4/EPA TO-10
Toxaphene	EPA TO-4/EPA TO-10
4,4´-DDD	EPA TO-4/EPA TO-10

The American Association for Laboratory Accreditation

World Class Accreditation

Accredited DoD ELAP Laboratory

A2LA has accredited

RTI LABORATORIES, INC.

Livonia, MI

for technical competence in the field of

Environmental Testing

In recognition of the successful completion of the A2LA evaluation process that includes an assessment of the laboratory's compliance with ISO/IEC 17025:2005, the 2003 NELAC Chapter 5 Standard, and the requirements of the Department of Defense Environmental Laboratory Accreditation Program (DoD ELAP) as detailed in the DoD Quality Systems Manual for Environmental Laboratories (QSM v4.1); accreditation is granted to this laboratory to perform recognized EPA methods as defined on the associated A2LA Environmental Scope of Accreditation. This accreditation demonstrates technical competence for this defined scope and the operation of a laboratory quality management system (*refer to joint ISO-ILAC-IAF Communiqué dated 8 January 2009*).

Presented this 15th day of March 2011.

President & CEO
For the Accreditation Council
Certificate Number 0570.03
Valid to October 31, 2012

For the tests or types of tests to which this accreditation applies, please refer to the laboratory's Environmental Scope of Accreditation.

Utah Department of Health
W. David Patton, Ph.D
Executive Director

Disease Control and Prevention
Patrick F. Luedtke, MD, MPH.
Director Unified State Labs: Public Health

Bureau of Laboratory Improvement
David B Mendenhall, MPA, MT (ASCP)
Bureau Director

State of Utah
GARY R HERBERT
Governor
GREGORY S BELL
Lieutenant Governor

STATE OF UTAH
DEPARTMENT OF HEALTH

ENVIRONMENTAL LABORATORY CERTIFICATION PROGRAM

CERTIFICATION

is hereby granted to

RTI Laboratories, Inc.

31628 Glendale Street
Livonia MI 48150

Scope of accreditiation is limited to the
State of Utah Accredited Fields of Accreditiation
Which accompanies this Certificate

Continued accredited status depends on successful
Ongoing particitpation in the program

EPA Number: MI00147
Expiration Date: 1/31/2012

Patrick F. Luedtke, MD, MPH.
Director of Public Health Laboratories
Deputy Director of Epidemiology and Laboratory Services

Utah Department of Health
W. David Patton, Ph.D
Executive Director

Disease Control and Prevention
Patrick F. Luedtke, MD, MPH.
Director Unified State Labs: Public Health

Bureau of Laboratory Improvement
David B Mendenhall, MPA, MT (ASCP)
Bureau Director

State of Utah
GARY R HERBERT
Governor
GREGORY S BELL
Lieutenant Governor

4/1/2011

RTI Laboratories, Inc.
Fred Hoitash
31628 Glendale Street
Livonia MI 48150

ID # RTI
EPA ID: MI00147

Director,

On the basis of your most recent assessment, Proficiency Testing results and continuing compliance with the ELCP requirements, the laboratory listed is certified for environmental monitoring under the Clean Water Act and authorized to perform the following methods, for the analytes and matrix listed:

Non-Potable Water

Inorganics and Metals

120.1 [1982]	Conductance (Specific Conductance, umhos at 25-C)
1631 E	Mercury in Water by Oxidation, Purge and Trap, and Cold Vapor Atomic Fluorescense Spectrometry
1664 A [1999]	Oil & Grease and Total Petroleum Hydrocarbons
200.8 [1994]	Aluminum
200.8 [1994]	Antimony
200.8 [1994]	Arsenic
200.8 [1994]	Barium
200.8 [1994]	Beryllium
200.8 [1994]	Boron
200.8 [1994]	Cadmium
200.8 [1994]	Chromium
200.8 [1994]	Cobalt
200.8 [1994]	Copper
200.8 [1994]	Iron
200.8 [1994]	Lead
200.8 [1994]	Manganese
200.8 [1994]	Molybdenum
200.8 [1994]	Nickel
200.8 [1994]	Selenium
200.8 [1994]	Silver
200.8 [1994]	Thallium
200.8 [1994]	Tin
200.8 [1994]	Vanadium
200.8 [1994]	Zinc
2320 B [20th ED]	Alkalinity (Titration) [SM 20th ED]
245.1 [1994]	Mercury
2540 B [20th ED]	Total Solids Dried at 103-105-C [SM 20th ED]
2540 C [20th ED	Total Dissolved Solids Dried at 180-C [SM 20th ED]
2540 D [20th ED	Total Suspended Solids Dried at 103-105-C [SM 20th ED]
300.0 [1993]	Bromide

Inorganics and Metals

300.0 [1993]	Chloride
300.0 [1993]	Fluoride
300.0 [1993]	Nitrate
300.0 [1993]	Nitrite
300.0 [1993]	ortho-Phosphate
300.0 [1993]	Phosphate
300.0 [1993]	Sulfate
300.0 [1993]	Nitrate/Nitrite
330.1 [1978]	Chlorine, Total Residual
351.2 [1978]	Nitrogen, Total Kjeldahl
410.4 [1993]	Chemical Oxygen Demand
420.1 [1978]	Phenolics
4500 (Cl) G [20t	Chlorine, Residual (Colorimetric, DPD) [SM 20th ED]
4500 (CN-) D [20	Cyanide (Titrimetric) [SM 20th ED]
4500 (CN-) G [2	Cyanides Amenable to Chlorination after Distillation [SM 20th ED]
4500 (H+) B [20t	pH (Electrometric) [SM 20th ED]
4500 (NH3) D [2	Nitrogen (Ammonia) (Ammonia-Selective Electrode) [SM 20th ED]
4500 (NO3-) E [2	Nitrogen (Nitrate, Cadmium Reduction) [SM 20th ED]
4500 (P) F [20th	Ortho-Phosphate (Automated Ascorbic Acid Reduction) [SM 20th ED]
5210 B [20th ED]	Biochemical Oxygen Demand 5-Day Test [SM 20th ED]
5210 B [20th ED]	Carboneous Biochemical Oxygen Demand (CBOD) [SM 20th ED]

Microbiological

9222 B [20th ED]	Total Coliform - MF Technique [SM 20th ED]
9222 D [20th ED	Fecal Coliform - MF Technique [SM 20th ED]

Organics

608	Organochlorine Pesticides and Polychlorinated Biphenyls
608	Aldrin
608	alpha-BHC
608	beta-BHC
608	delta-BHC
608	gamma-BHC (Lindane)
608	Chlordane
608	4,4'-DDD
608	4,4'-DDE
608	4,4'-DDT
608	Dieldrin
608	Endosulfan I
608	Endosulfan II
608	Endosulfan Sulfate
608	Endrin
608	Endrin Aldehyde
608	Heptachlor
608	Heptachlor Epoxide
608	Methoxychlor
608	Toxaphene
608	Aroclor 1016
608	Aroclor 1221
608	Aroclor 1232
608	Aroclor 1242
608	Aroclor 1248
608	Aroclor 1254
608	Aroclor 1260
624	Purgeables
624	Acrolein

Organics

624	Acrylonitrile
624	Benzene
624	Bromodichloromethane
624	Bromoform
624	Bromomethane
624	Carbon Tetrachloride
624	Chlorobenzene
624	Chloroethane
624	2-Chloroethylvinyl Ether
624	Chloroform
624	Chloromethane
624	Dibromochloromethane
624	1,2-Dichlorobenzene
624	1,3-Dichlorobenzene
624	1,4-Dichlorobenzene
624	1,1-Dichloroethane
624	1,2-Dichloroethane
624	1,1-Dichloroethene (Vinylidene Chloride)
624	trans-1,2-Dichloroethene
624	cis-1,3-Dichloropropene
624	trans-1,3-Dichloropropene
624	Ethylbenzene
624	Dichloromethane (DCM, Methylene chloride)
624	1,1,2,2-Tetrachloroethane
624	Tetrachloroethylene
624	Toluene
624	1,1,1-Trichloroethane
624	1,1,2-Trichloroethane
624	Trichloroethene
624	Trichlorofluoromethane
624	Vinyl Chloride
624	Xylenes, total
625	Base/Neutrals and Acids
625	Acenaphthene
625	Acenaphthylene
625	Anthracene
625	Benzidine
625	Benzo(a)anthracene
625	Benzo(b)fluoranthene
625	Benzo(k)fluoranthene
625	Benzo(g,h,i)perylene
625	Benzo(a)pyrene
625	Benzyl Butyl Phthalate
625	bis(2-Chloroethyl)ether
625	bis(2-Chloroethoxy)methane
625	bis(2-Ethylhexyl)phthalate
625	bis(2-Chloroisopropyl)ether
625	4-Bromophenyl Phenyl Ether
625	4-Chlorophenyl Phenyl Ether
625	Chrysene
625	Dibenz(a,h)anthracene
625	Di-n-butylphthalate
625	1,2-Dichlorobenzene
625	1,3-Dichlorobenzene

Organics

625	1,4-Dichlorobenzene
625	3,3'-Dichlorobenzidine
625	Diethyl phthalate
625	Dimethyl phthalate
625	Di-n-octylphthalate
625	Fluoranthene
625	Fluorene
625	Hexachlorobenzene
625	Hexachlorobutadiene
625	Hexachlorocyclopentadiene
625	Hexachloroethane
625	Indeno(1,2,3-cd)pyrene
625	Isophorone
625	Naphthalene
625	Nitrobenzene
625	N-Nitrosodimethylamine
625	N-Nitrosodi-n-propylamine
625	N-Nitrosodiphenylamine
625	Phenanthrene
625	Pyrene
625	1,2,4-Trichlorobenzene
625	4-Chloro-3-methylphenol
625	2-Chlorophenol
625	2,4-Dichlorophenol
625	2,4-Dimethylphenol
625	2,4-Dinitrophenol
625	2-Methyl- 4,6-dinitrophenol
625	2-Nitrophenol
625	4-Nitrophenol
625	Pentachlorophenol
625	Phenol
625	2,4,5-Trichlorophenol
625	2,4,6-Trichlorophenol

The effective date of this certificate letter is: 2/1/2011.

The analytes by method which a laboratory is authorized to perform at any given time will be those indicated in the most recent certificate letter. The most recent certification letter supersedes all previous certification or authorization letters. It is the certified laboratory's responsibility to review this letter for discrepancies. The certified laboratory must document any discrepancies in this letter and send notice to this bureau within 15 days of receipt. This certificate letter will be recalled in the event your laboratory's certification is revoked.

Respectfully,

Patrick F. Luedtke

Patrick F. Luedtke, MD, MPH.
Director of Public Health Laboratories
Deputy Director of Epidemiology and Laboratory Services

Utah Department of Health
W. David Patton, Ph.D
Executive Director

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GREGORY S BELL
Lieutenant Governor

4/1/2011

RTI Laboratories, Inc.
Fred Hoitash
31628 Glendale Street
Livonia MI 48150

ID # RTI
EPA ID: MI00147

Director,

On the basis of your most recent assessment, Proficiency Testing results and continuing compliance with the ELCP requirements, the laboratory listed is certified for environmental monitoring under the Resource Conservation and Recovery Act and authorized to perform the following methods, for the analytes and matrix listed:

Characteristics

	Solid	Non-Potable Water	
1010	✔	☐	Ignitability
1030	✔	☐	Ignitability
1311	✔	☐	Toxicity Characteristic Leaching Procedure Metals
1311	✔	☐	Toxicity Characteristic Leaching Procedure Semi-Volatiles
1311	✔	☐	Toxicity Characteristic Leaching Procedure Volatiles
1312	✔	☐	Synthetic Precipitation Leaching Procedure (TCLP Approval)

Inorganics

	Solid	Non-Potable Water	
9012 A	✔	✔	Amenable Cyanide
9012 A	✔	✔	Total Cyanide
9030 B	✔	✔	Sulfide Distillation Procedure
9031	✔	☐	Extractable Sulfides
9045 C	✔	☐	Soil and Waste pH
9050 A	☐	✔	Specific Conductance
9056 A	✔	✔	Bromide
9056 A	✔	✔	Chloride
9056 A	✔	✔	Fluoride
9056 A	✔	✔	Nitrate
9056 A	✔	✔	Nitrite
9056 A	✔	✔	Ortho Phosphate
9056 A	✔	✔	Sulfates
9065	☐	✔	Phenolics
9095 A	✔	☐	Paint Filter Liquids Test

The expiration for the laboratory's certification is 1/31/2012. The Utah Environmental Laboratory Certification Program (ELCP) encourages clients and data users to verify the most current certification letter for the authorized method.

Metal Digestion

	Solid	Non-Potable Water	
3020 A		✓	Acid Digestion for Total Metals
3050 B	✓		Acid Digestion of Sediments, Sludges and Soils
3052	✓		Microwave Acid Digestion of Silliceous and Organic Matrixes
3060 A	✓		Alkaline Digestion for Hexavalent Chromium

Metals

	Solid	Non-Potable Water	
6020 A	✓	✓	Aluminum
6020 A	✓	✓	Antimony
6020 A	✓	✓	Arsenic
6020 A	✓	✓	Barium
6020 A	✓	✓	Beryllium
6020 A	✓	✓	Cadmium
6020 A	✓	✓	Calcium
6020 A	✓	✓	Chromium
6020 A	✓	✓	Cobalt
6020 A	✓	✓	Copper
6020 A	✓	✓	Iron
6020 A	✓	✓	Lead
6020 A	✓	✓	Magnesium
6020 A	✓	✓	Manganese
6020 A	✓	✓	Molybdenum
6020 A	✓	✓	Nickel
6020 A	✓	✓	Potassium
6020 A	✓	✓	Selenium
6020 A	✓	✓	Silver
6020 A	✓	✓	Thallium
6020 A	✓	✓	Vanadium
6020 A	✓	✓	Zinc
7196 A	✓	✓	Chromium, Hexavalent (Chromium, VI)
7470 A	✓	✓	Mercury
7471 A	✓		Mercury

Miscellaneous

	Solid	Non-Potable Water	
5050	✓		Bomb Preparation

Organic Cleanup

	Solid	Non-Potable Water	
3620 C	✓	✓	Florisil Cleanup
3660 A	✓	✓	Sulfur Cleanup
3665 A	✓	✓	Sulfuric Acid/Permanganate Cleanup

Organic Extraction

	Solid	Non-Potable Water	
3510 C		✓	Separatory Funnel Liquid-Liquid Extractions
3535 A		✓	Solid Phase Extraction
3545 A	✓		Pressurized Fluid Extraction

Organic Extraction

	Solid	Non-Potable Water	
3550 B	✓		Ultrasonic Extraction

Organic Instrumentation

	Solid	Non-Potable Water	
8015B	✓	✓	Diesel Range Organics (DROs)
8015B	✓	✓	Ethanol
8015B	✓	✓	Ethylene Glycol
8015B	✓	✓	Gasoline Range Organics (GROs)
8015B	✓	✓	Methanol
8015B	✓	✓	Nonhalogenated Organics Using GC/FID
8081A	✓	✓	4,4'-DDD
8081A	✓	✓	4,4'-DDE
8081A	✓	✓	4,4'-DDT
8081A	✓	✓	Aldrin
8081A	✓	✓	alpha-BHC(alpha-hexachlorocyclohexane)
8081A	✓	✓	alpha-Chlordane
8081A	✓	✓	beta-BHC(beta-hexachlorocyclohexane)
8081A	✓	✓	delta-BHC(delta-hexachlorocyclohexane)
8081A	✓	✓	Dieldrin
8081A	✓	✓	Endosulfan I
8081A	✓	✓	Endosulfan II
8081A	✓	✓	Endosulfan sulfate
8081A	✓	✓	Endrin
8081A	✓	✓	Endrin Aldehyde
8081A	✓	✓	Endrin Ketone
8081A	✓	✓	gamma-BHC (Lindane, gamma-hexachlorocyclohexane)
8081A	✓	✓	gamma-Chlordane
8081A	✓	✓	Heptachlor
8081A	✓	✓	Heptachlor Epoxide
8081A	✓	✓	Methoxychlor
8081A	✓	✓	Organochlorine Pesticides
8081A	✓	✓	Toxaphene [Chlorinated camphene]
8082	✓	✓	Aroclor-1016 [PCB-1016]
8082	✓	✓	Aroclor-1221 PCB-1221]
8082	✓	✓	Aroclor-1232 [PCB-1232]
8082	✓	✓	Aroclor-1242 [PCB-1242]
8082	✓	✓	Aroclor-1248 [PCB-1248]
8082	✓	✓	Aroclor-1254 [PCB-1254]
8082	✓	✓	Aroclor-1260 [PCB-1260]
8082	✓	✓	PCBs
8151 A	✓	✓	2,4,5-T
8151 A	✓	✓	2,4,5-TP (Silvex)
8151 A	✓	✓	2,4-D
8151 A	✓	✓	2,4-DB
8151 A	✓	✓	Chlorinated Herbicides
8151 A	✓	✓	Dalapon
8151 A	✓	✓	DCPA [di acid degradate]
8151 A	✓	✓	Dicamba
8151 A	✓	✓	Dichlorprop(Dichloroprop)
8151 A	✓	✓	Dinoseb (DNBP, 2-sec-butyl-4,6-dinitrophenol)

Organic Instrumentation

	Solid	Non-Potable Water	
8151 A	✔	✔	MCPA
8151 A	✔	✔	MCPP
8151 A	✔	✔	Pentachlorophenol
8151 A	✔	✔	Picloram
8260 B	✔	✔	1,1,1,2-Tetrachloroethane
8260 B	✔	✔	1,1,1-Trichloroethane
8260 B	✔	✔	1,1,2,2-Tetrachloroethane
8260 B	✔	✔	1,1,2-Trichloroethane
8260 B	✔	✔	1,1-Dichloroethane
8260 B	✔	✔	1,1-Dichloroethylene (-ethene)[Vinylidene Chloride]
8260 B	✔	✔	1,1-Dichloropropene
8260 B	✔	✔	1,2,3-Trichlorobenzene
8260 B	✔	✔	1,2,3-Trichloropropane
8260 B	✔	✔	1,2,4-Trichlorobenzene
8260 B	✔	✔	1,2,4-Trimethylbenzene
8260 B	✔	✔	1,2-Dibromo-3-chloropropane (DBCP, Dibromochloropropane)
8260 B	✔	✔	1,2-Dibromoethane (EDB, Ethylene dibromide)
8260 B	✔	✔	1,2-Dichlorobenzene
8260 B	✔	✔	1,2-Dichloroethane
8260 B	✔	✔	1,2-Dichloropropane
8260 B	✔	✔	1,3,5-Trimethylbenzene
8260 B	✔	✔	1,3-Dichlorobenzene
8260 B	✔	✔	1,3-Dichloropropane
8260 B	✔	✔	1,4-Dichlorobenzene
8260 B	✔	✔	2,2-Dichloropropane
8260 B	✔	✔	2-Chloroethyl Vinyl Ether
8260 B	✔	✔	2-Chlorotoluene
8260 B	✔	✔	2-Hexanone
8260 B	✔	✔	4-Chlorotoluene
8260 B	✔	✔	4-Methyl-2-pentanone (MIBK, Isopropylacetone, Hexone)
8260 B	✔	✔	Acetone
8260 B	✔	✔	Acrylonitrile
8260 B	✔	✔	Benzene
8260 B	✔	✔	Bromobenzene
8260 B	✔	✔	Bromochloromethane
8260 B	✔	✔	Bromodichloromethane
8260 B	✔	✔	Bromoform
8260 B	✔	✔	Carbon Disulfide
8260 B	✔	✔	Carbon Tetrachloride
8260 B	✔	✔	Chlorobenzene
8260 B	✔	✔	Chlorodibromomethane [Dibromochloromethane]
8260 B	✔	✔	Chloroethane
8260 B	✔	✔	Chloroform
8260 B	✔	✔	cis-1,2-Dichloroethene (-ethylene)
8260 B	✔	✔	cis-1,3-dichloropropene
8260 B	✔	✔	Dibromomethane
8260 B	✔	✔	Dichlorodifluoromethane
8260 B	✔	✔	Dichloromethane (DCM, Methylene chloride)
8260 B	✔	✔	Diethyl Ether (Ethyl Ether)
8260 B	✔	✔	Ethyl Methacrylate
8260 B	✔	✔	Ethylbenzene

Organic Instrumentation

	Solid	Non-Potable Water	
8260 B	✔	✔	Hexachlorobutadiene
8260 B	✔	✔	Hexachloroethane
8260 B	✔	✔	Iodomethane (Methyl iodide)
8260 B	✔	✔	Isopropylbenzene
8260 B	✔	✔	meta-Xylene
8260 B	✔	✔	Methyl bromide [Bromomethane]
8260 B	✔	✔	Methyl chloride [Chloromethane]
8260 B	✔	✔	Methyl Ethyl Ketone (MEK, 2-Butanone)
8260 B	✔	✔	Methyl-t-Butyl Ether (MTBE)
8260 B	✔	✔	Naphthalene
8260 B	✔	✔	n-Butylbenzene
8260 B	✔	✔	n-Propylbenzene
8260 B	✔	✔	ortho-Xylene
8260 B	✔	✔	para-Xylene
8260 B	✔	✔	p-Isopropyltoluene
8260 B	✔	✔	sec-Butylbenzene
8260 B	✔	✔	Styrene
8260 B	✔	✔	tert-Butyl Alcohol (TBA)
8260 B	✔	✔	tert-Butylbenzene
8260 B	✔	✔	Tetrachloroethylene (Perchloroethylene -ethene)
8260 B	✔	✔	Toluene
8260 B	✔	✔	trans-1,2-Dichloroethylene (-ethene)
8260 B	✔	✔	trans-1,3-Dichloropropylene (-propene)
8260 B	✔	✔	trans-1,4-dichloro-2-butene
8260 B	✔	✔	Trichloroethene (Trichloroethylene)
8260 B	✔	✔	Trichlorofluoromethane
8260 B	✔	✔	Vinyl Acetate
8260 B	✔	✔	Vinyl Chloride
8260 B	✔	✔	Volatile Organic Compounds
8260 B	✔	✔	Xylenes, Total
8270 D	✔	✔	1,2,4-Trichlorobenzene
8270 D	✔	✔	1,2-Dichlorobenzene
8270 D	✔	✔	1,3-Dichlorobenzene
8270 D	✔	✔	1,4-Dichlorobenzene
8270 D	✔	✔	2,3,4,6-Tetrachlorophenol
8270 D	✔	✔	2,4,5-Trichlorophenol
8270 D	✔	✔	2,4,6-Trichlorophenol
8270 D	✔	✔	2,4-Dichlorophenol
8270 D	✔	✔	2,4-Dimethylphenol
8270 D	✔	✔	2,4-Dinitrophenol
8270 D	✔	✔	2,4-Dinitrotoluene (2,4-DNT)
8270 D	✔	✔	2,6-Dichlorophenol
8270 D	✔	✔	2,6-Dinitrotoluene (2,6-DNT)
8270 D	✔	✔	2-Chloronaphthalene
8270 D	✔	✔	2-Methyl-4,6-dinitrophenol (4,6-Dinitro-2-methylphenol)
8270 D	✔	✔	2-Methylnaphthalene
8270 D	✔	✔	2-Methylphenol (o-cresol, 2-Hydroxytoluene)
8270 D	✔	✔	2-Nitroaniline
8270 D	✔	✔	2-Nitrophenol
8270 D	✔	✔	3,3'-Dichlorobenzidine
8270 D	✔	✔	3-Methylphenol (m-cresol, 3-Hydroxytoluene)

Organic Instrumentation

	Solid	Non-Potable Water	
8270 D	✔	✔	3-Nitroaniline
8270 D	✔	✔	4-Bromophenyl Phenyl Ether
8270 D	✔	✔	4-Chloro-3-methylphenol
8270 D	✔	✔	4-Chloroaniline
8270 D	✔	✔	4-Chlorophenyl Phenyl Ether
8270 D	✔	✔	4-Methylphenol (p-cresol, 4-Hydroxytoluene)
8270 D	✔	✔	4-Nitroaniline
8270 D	✔	✔	4-Nitrophenol
8270 D	✔	✔	Acenaphthene
8270 D	✔	✔	Acenaphthylene
8270 D	✔	✔	Aniline
8270 D	✔	✔	Anthracene
8270 D	✔	✔	Benzidine
8270 D	✔	✔	Benzo(a)anthracene
8270 D	✔	✔	Benzo(a)pyrene
8270 D	✔	✔	Benzo(b)fluoranthene
8270 D	✔	✔	Benzo(g,h,i)perylene
8270 D	✔	✔	Benzo(k)fluoranthene
8270 D	✔	✔	Benzoic Acid
8270 D	✔	✔	Benzyl alcohol
8270 D	✔	✔	bis(2-chloroethoxy)methane
8270 D	✔	✔	bis(2-Chloroethyl)ether
8270 D	✔	✔	bis(2-chloroisopropyl)ether
8270 D	✔	✔	bis(2-Ethylhexyl) phthalate (DEHP)
8270 D	✔	✔	Butyl Benzyl Phthalate
8270 D	✔	✔	Chrysene
8270 D	✔	✔	Dibenzo(a,h)anthracene
8270 D	✔	✔	Dibenzofuran
8270 D	✔	✔	Diethyl Phthalate
8270 D	✔	✔	Dimethyl Phthalate
8270 D	✔	✔	Di-n-butyl phthalate
8270 D	✔	✔	Di-n-octyl Phthalate
8270 D	✔	✔	Fluoranthene
8270 D	✔	✔	Fluorene
8270 D	✔	✔	Hexachlorobenzene
8270 D	✔	✔	Hexachlorobutadiene
8270 D	✔	✔	Hexachlorocyclopentadiene
8270 D	✔	✔	Hexachloroethane
8270 D	✔	✔	Indeno(1,2,3-cd)pyrene
8270 D	✔	✔	Isophorone
8270 D	✔	✔	Naphthalene
8270 D	✔	✔	Nitrobenzene
8270 D	✔	✔	N-Nitrosodiethylamine
8270 D	✔	✔	n-Nitrosodimethylamine
8270 D	✔	✔	n-Nitroso-di-n-Propylamine
8270 D	✔	✔	n-Nitrosodiphenylamine
8270 D	✔	✔	Pentachlorophenol
8270 D	✔	✔	Phenanthrene
8270 D	✔	✔	Phenol
8270 D	✔	✔	Pyrene
8270 D	✔	✔	Semivolatile Organic Compounds

4431 South 2700 West • Taylorsville, UT 84119 • phone (801)965-2400 • fax (801)965-2544
www.health.utah.gov/els/labimp/

Organic Instrumentation

	Solid	Non-Potable Water	
8330B	✔	✔	1,3,5-Trinitrobenzene (1,3,5-TNB)
8330B	✔	✔	1,3-Dinitrobenzene (1,3-DNB)
8330B	✔	✔	2,4,6-Trinitrotoluene (2,4,6-TNT)
8330B	✔	✔	2,4-Dinitrotoluene (2,4-DNT)
8330B	✔	✔	2,6-Dinitrotoluene (2,6-DNT)
8330B	✔	✔	2-Amino-4,6-Dinitrotoluene (2-Am-DNT)
8330B	✔	✔	2-Nitrotoluene (2-NT)
8330B	✔	✔	3,5-Dinitroaniline
8330B	✔	✔	3-Nitrotoluene (3-NT)
8330B	✔	✔	4-Amino-2,6-Dinitrotoluene (4-Am-DNT)
8330B	✔	✔	4-Nitrotoluene (4-NT)
8330B	✔	✔	Hexahydro-1, 3, 5-tritro-1, 3, 5-triazine (RDX)
8330B	✔	✔	Methyl-2,4,6-Trinitrophenylnitramine (TETRYL)
8330B	✔	✔	Nitroaromatics and Nitramines
8330B	✔	✔	Nitrobenzene
8330B	✔	✔	Nitroglycerin
8330B	✔	✔	Octahydro-1,3,5,7-Tetranitro-1,3,5,7-Tetrazocine (HMX)
8330B	✔	✔	Pentaerythrite tetranitrate (PETN)

Volatile Organic Preparation

	Solid	Non-Potable Water	
5030 C	☐	✔	Purge-and-Trap for Aqueous Samples
5035A	✔	☐	Purge-and-Trap and Extraction for Volatile Organics

The effective date of this certificate letter is: 2/1/2011.

The analytes by method which a laboratory is authorized to perform at any given time will be those indicated in the most recent certificate letter. The most recent certification letter supersedes all previous certification or authorization letters. It is the certified laboratory's responsibility to review this letter for discrepancies. The certified laboratory must document any discrepancies in this letter and send notice to this bureau within 15 days of receipt. This certificate letter will be recalled in the event your laboratory's certification is revoked.

Respectfully,

Patrick F. Luedtke

Patrick F. Luedtke, MD, MPH.
Director of Public Health Laboratories
Deputy Director of Epidemiology and Laboratory

SOIL-74 Final Complete Report

ERA
A Waters Company

Charles O'Bryan
Director, Quality Management
RTI Laboratories
31628 Glendale Avenue
Livonia, MI 48150
(734) 422-8000

EPA ID: MI00147
ERA Customer Number: R751701
Report Issued: 06/23/11
Study Dates: 04/18/11 - 06/02/11

Anal. No.	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description
SOIL Volatiles in Soil (cat# 623)							
4315	Acetone	µg/kg	278	361	40.0 - 637	Acceptable	EPA 8260B
4320	Acetonitrile	µg/kg		739	0.00 - 1500	Not Reported	
4325	Acrolein	µg/kg	< 5	0.00		Acceptable	EPA 8260B
4375	Benzene	µg/kg	74.6	93.5	55.6 - 128	Acceptable	EPA 8260B
4385	Bromobenzene	µg/kg	139	166	70.3 - 258	Acceptable	EPA 8260B
4395	Bromodichloromethane	µg/kg	157	190	126 - 261	Acceptable	EPA 8260B
4400	Bromoform	µg/kg	< 5	0.00		Acceptable	EPA 8260B
4950	Bromomethane	µg/kg	< 5	0.00		Acceptable	EPA 8260B
4410	2-Butanone (MEK)	µg/kg	258	280	62.5 - 456	Acceptable	EPA 8260B
5000	tert-Butyl methyl ether (MTBE)	µg/kg	85.0	87.2	36.5 - 132	Acceptable	EPA 8260B
4450	Carbon disulfide	µg/kg	< 5	0.00		Acceptable	EPA 8260B
4455	Carbon tetrachloride	µg/kg	< 5	0.00		Acceptable	EPA 8260B
4475	Chlorobenzene	µg/kg	< 5	0.00		Acceptable	EPA 8260B
4575	Chlorodibromomethane	µg/kg	< 5	0.00		Acceptable	EPA 8260B
4485	Chloroethane	µg/kg	106	171	56.0 - 272	Acceptable	EPA 8260B
4500	2-Chloroethylvinylether	µg/kg	< 5	0.00		Acceptable	EPA 8260B
4505	Chloroform	µg/kg	102	124	75.1 - 173	Acceptable	EPA 8260B
4960	Chloromethane	µg/kg	< 5	0.00		Acceptable	EPA 8260B
4570	1,2-Dibromo-3-chloropropane (DBCP)	µg/kg	111	89.9	49.6 - 149	Acceptable	EPA 8260B
4585	1,2-Dibromoethane (EDB)	µg/kg	134	145	87.3 - 199	Acceptable	EPA 8260B
4595	Dibromomethane	µg/kg	< 5	0.00		Acceptable	EPA 8260B
4610	1,2-Dichlorobenzene	µg/kg	< 5	0.00		Acceptable	EPA 8260B
4615	1,3-Dichlorobenzene	µg/kg	< 5	0.00		Acceptable	EPA 8260B
4620	1,4-Dichlorobenzene	µg/kg	54.2	67.3	23.3 - 95.7	Acceptable	EPA 8260B
4625	Dichlorodifluoromethane (Freon 12)	µg/kg	< 5	0.00		Acceptable	EPA 8260B
4630	1,1-Dichloroethane	µg/kg	136	170	96.8 - 245	Acceptable	EPA 8260B
4635	1,2-Dichloroethane	µg/kg	185	197	114 - 272	Acceptable	EPA 8260B
4640	1,1-Dichloroethylene	µg/kg	59.3	77.6	55.3 - 116	Acceptable	EPA 8260B
4645	cis-1,2-Dichloroethylene	µg/kg	117	194	111 - 276	Acceptable	EPA 8260B
4700	trans-1,2-Dichloroethylene	µg/kg	< 5	0.00		Acceptable	EPA 8260B
4655	1,2-Dichloropropane	µg/kg	100	115	67.4 - 154	Acceptable	EPA 8260B
4680	cis-1,3-Dichloropropylene	µg/kg	145	193	103 - 257	Acceptable	EPA 8260B

All analytes are included in ERA's A2LA accreditation. Lab Code: 1539-01

SOIL-74 Final Complete Report

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Director, Quality Management
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(734) 422-8000

EPA ID: MI00147
ERA Customer Number: R751701
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Anal. No.	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description
SOIL Volatiles in Soil (cat# 623) (Continued)							
4685	trans-1,3-Dichloropropylene	µg/kg	35.4	42.5	22.8 - 55.6	Acceptable	EPA 8260B
4765	Ethylbenzene	µg/kg	33.3	42.1	22.1 - 62.7	Acceptable	EPA 8260B
4860	2-Hexanone	µg/kg	< 5	0.00		Acceptable	EPA 8260B
4900	Isopropylbenzene	µg/kg	124	166	77.0 - 275	Acceptable	EPA 8260B
4975	Methylene chloride	µg/kg	20.8	29.5	13.4 - 46.1	Acceptable	EPA 8260B
4995	4-Methyl-2-pentanone (MIBK)	µg/kg	199	205	89.6 - 299	Acceptable	EPA 8260B
5005	Naphthalene	µg/kg	189	190	104 - 260	Acceptable	EPA 8260B
5100	Styrene	µg/kg	< 5	0.00		Acceptable	EPA 8260B
5105	1,1,1,2-Tetrachloroethane	µg/kg	80.8	92.0	59.8 - 126	Acceptable	EPA 8260B
5110	1,1,2,2-Tetrachloroethane	µg/kg	46.2	48.0	23.8 - 72.0	Acceptable	EPA 8260B
5115	Tetrachloroethylene	µg/kg	84.4	136	61.2 - 197	Acceptable	EPA 8260B
5140	Toluene	µg/kg	69.0	97.1	55.7 - 136	Acceptable	EPA 8260B
5155	1,2,4-Trichlorobenzene	µg/kg	60.2	94.5	27.2 - 141	Acceptable	EPA 8260B
5160	1,1,1-Trichloroethane	µg/kg	44.1	55.7	30.0 - 79.1	Acceptable	EPA 8260B
5165	1,1,2-Trichloroethane	µg/kg	109	122	71.5 - 168	Acceptable	EPA 8260B
5170	Trichloroethylene	µg/kg	88.6	103	52.8 - 147	Acceptable	EPA 8260B
5175	Trichlorofluoromethane	µg/kg	< 5	0.00		Acceptable	EPA 8260B
5180	1,2,3-Trichloropropane (TCP)	µg/kg	< 5	0.00		Acceptable	EPA 8260B
5225	Vinyl acetate	µg/kg		0.00		Not Reported	
5235	Vinyl chloride	µg/kg	70.3	111	30.5 - 199	Acceptable	EPA 8260B
5260	Xylenes, total	µg/kg	150	188	92.2 - 277	Acceptable	EPA 8260B

SOIL-74 Final Complete Report

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EPA ID: MI00147
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Report Issued: 06/23/11
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Anal. No.	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description
SOIL Ready-to-Use VOAs in Soil (cat# 870)							
4315	Acetone	µg/kg	10900	15600	4450 - 23800	Acceptable	EPA 8260B
4320	Acetonitrile	µg/kg		0.00		Not Reported	
4325	Acrolein	µg/kg	< 500	0.00		Acceptable	EPA 8260B
4375	Benzene	µg/kg	8030	7740	5650 - 10000	Acceptable	EPA 8260B
4385	Bromobenzene	µg/kg	6880	7660	5700 - 9130	Acceptable	EPA 8260B
4395	Bromodichloromethane	µg/kg	4660	4730	3220 - 6660	Acceptable	EPA 8260B
4400	Bromoform	µg/kg	7630	8060	5450 - 10700	Acceptable	EPA 8260B
4950	Bromomethane	µg/kg	< 50	0.00		Acceptable	EPA 8260B
4410	2-Butanone (MEK)	µg/kg	15100	18900	5360 - 28400	Acceptable	EPA 8260B
5000	tert-Butyl methyl ether (MTBE)	µg/kg	< 50	0.00		Acceptable	EPA 8260B
4450	Carbon disulfide	µg/kg	< 50	0.00		Acceptable	EPA 8260B
4455	Carbon tetrachloride	µg/kg	4740	4170	2570 - 5720	Acceptable	EPA 8260B
4475	Chlorobenzene	µg/kg	< 50	0.00		Acceptable	EPA 8260B
4575	Chlorodibromomethane	µg/kg	< 50	0.00		Acceptable	EPA 8260B
4485	Chloroethane	µg/kg	< 50	0.00		Acceptable	EPA 8260B
4500	2-Chloroethylvinylether	µg/kg	< 50	0.00		Acceptable	EPA 8260B
4505	Chloroform	µg/kg	8220	7870	5430 - 10300	Acceptable	EPA 8260B
4960	Chloromethane	µg/kg	< 50	0.00		Acceptable	EPA 8260B
4570	1,2-Dibromo-3-chloropropane (DBCP)	µg/kg	< 50	0.00		Acceptable	EPA 8260B
4585	1,2-Dibromoethane (EDB)	µg/kg	< 50	0.00		Acceptable	EPA 8260B
4595	Dibromomethane	µg/kg	6720	6700	5140 - 7640	Acceptable	EPA 8260B
4610	1,2-Dichlorobenzene	µg/kg	3460	3680	2640 - 4830	Acceptable	EPA 8260B
4615	1,3-Dichlorobenzene	µg/kg	6010	6800	4890 - 8840	Acceptable	EPA 8260B
4620	1,4-Dichlorobenzene	µg/kg	< 50	0.00		Acceptable	EPA 8260B
4625	Dichlorodifluoromethane (Freon 12)	µg/kg	< 50	0.00		Acceptable	EPA 8260B
4630	1,1-Dichloroethane	µg/kg	3220	3480	2310 - 4840	Acceptable	EPA 8260B
4635	1,2-Dichloroethane	µg/kg	8840	8480	6290 - 10800	Acceptable	EPA 8260B
4640	1,1-Dichloroethylene	µg/kg	< 50	0.00		Acceptable	EPA 8260B
4645	cis-1,2-Dichloroethylene	µg/kg	< 50	0.00		Acceptable	EPA 8260B
4700	trans-1,2-Dichloroethylene	µg/kg	< 50	9810	6920 - 12900	Not Acceptable	EPA 8260B
4655	1,2-Dichloropropane	µg/kg	< 50	0.00		Acceptable	EPA 8260B
4680	cis-1,3-Dichloropropylene	µg/kg	3180	3940	2530 - 4570	Acceptable	EPA 8260B

SOIL-74 Final Complete Report

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A Waters Company

Charles O'Bryan
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31628 Glendale Avenue
Livonia, MI 48150
(734) 422-8000

EPA ID: MI00147
ERA Customer Number: R751701
Report Issued: 06/23/11
Study Dates: 04/18/11 - 06/02/11

Anal. No.	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description
SOIL Ready-to-Use VOAs in Soil (cat# 870) (Continued)							
4685	trans-1,3-Dichloropropylene	µg/kg	7790	9720	4730 - 13300	Acceptable	EPA 8260B
4765	Ethylbenzene	µg/kg	5650	5840	4010 - 7880	Acceptable	EPA 8260B
4835	Hexachlorobutadiene	µg/kg	< 50	0.00		Acceptable	EPA 8260B
4840	Hexachloroethane	µg/kg	1320	1720	818 - 2050	Acceptable	EPA 8260B
4860	2-Hexanone	µg/kg	13800	18700	11200 - 23600	Acceptable	EPA 8260B
4900	Isopropylbenzene	µg/kg	2420	2800	1940 - 3780	Acceptable	EPA 8260B
4975	Methylene chloride	µg/kg	6940	8160	4510 - 11500	Acceptable	EPA 8260B
4995	4-Methyl-2-pentanone (MIBK)	µg/kg	11400	14100	8220 - 18600	Acceptable	EPA 8260B
5005	Naphthalene	µg/kg	4350	5120	2870 - 6890	Acceptable	EPA 8260B
5015	Nitrobenzene	µg/kg		0.00		Not Reported	
5100	Styrene	µg/kg	4120	4570	3530 - 5440	Acceptable	EPA 8260B
5105	1,1,1,2-Tetrachloroethane	µg/kg	< 50	0.00		Acceptable	EPA 8260B
5110	1,1,2,2-Tetrachloroethane	µg/kg	2740	3150	1630 - 4510	Acceptable	EPA 8260B
5115	Tetrachloroethylene	µg/kg	5420	6240	4080 - 8570	Acceptable	EPA 8260B
5140	Toluene	µg/kg	4590	5140	3620 - 6750	Acceptable	EPA 8260B
5155	1,2,4-Trichlorobenzene	µg/kg	3130	4090	2820 - 4870	Acceptable	EPA 8260B
5160	1,1,1-Trichloroethane	µg/kg	4750	4390	3140 - 5700	Acceptable	EPA 8260B
5165	1,1,2-Trichloroethane	µg/kg	8570	9150	6380 - 12000	Acceptable	EPA 8260B
5170	Trichloroethylene	µg/kg	7590	7190	5020 - 9530	Acceptable	EPA 8260B
5175	Trichlorofluoromethane	µg/kg	< 50	0.00		Acceptable	EPA 8260B
5180	1,2,3-Trichloropropane (TCP)	µg/kg	< 50	0.00		Acceptable	EPA 8260B
5225	Vinyl acetate	µg/kg		0.00		Not Reported	
5235	Vinyl chloride	µg/kg	7470	9200	3060 - 14400	Acceptable	EPA 8260B
5260	Xylenes, total	µg/kg	10400	11200	7970 - 14900	Acceptable	EPA 8260B
SOIL Nitroaromatics & Nitramines in Soil (cat# 871)							
9306	4-Amino-2,6-dinitrotoluene	µg/kg	988	2280	674 - 3020	Acceptable	EPA 8330B
9303	2-Amino-4,6-dinitrotoluene	µg/kg	1320	2860	1010 - 3720	Acceptable	EPA 8330B
6160	1,3-Dinitrobenzene	µg/kg	1120	2320	768 - 3430	Acceptable	EPA 8330B
6185	2,4-Dinitrotoluene	µg/kg	1730	3580	594 - 5690	Acceptable	EPA 8330B
6190	2,6-Dinitrotoluene	µg/kg	1670	3600	1120 - 5120	Acceptable	EPA 8330B
9522	HMX	µg/kg	< 50	0.00		Acceptable	EPA 8330B
5015	Nitrobenzene	µg/kg	4160	8400	2020 - 12800	Acceptable	EPA 8330B
9507	2-Nitrotoluene	µg/kg	3710	7650	2690 - 10900	Acceptable	EPA 8330B
9510	3-Nitrotoluene	µg/kg	4520	9420	3150 - 13200	Acceptable	EPA 8330B
9513	4-Nitrotoluene	µg/kg	2010	4330	3200 - 5070	Not Acceptable	EPA 8330B
9432	RDX	µg/kg	2600	5920	1400 - 8010	Acceptable	EPA 8330B
6415	Tetryl	µg/kg	< 200	0.00		Acceptable	EPA 8330B
6885	1,3,5-Trinitrobenzene	µg/kg	4010	8720	872 - 12800	Acceptable	EPA 8330B
9651	2,4,6-Trinitrotoluene	µg/kg	3660	8800	5570 - 9680	Not Acceptable	EPA 8330B

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WP-195 Final Complete Report

Charles O'Bryan
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31628 Glendale Avenue
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734-422-8000

EPA ID: MI00147
ERA Customer Number: R751701
Report Issued: 06/16/11
Study Dates: 04/11/11 - 05/26/11

Anal. No.	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description
WP Volatiles (cat# 830)							
4315	Acetone	µg/L	49.1	48.2	9.34 - 78.0	Acceptable	EPA 8260B
4320	Acetonitrile	µg/L		0.00		Not Reported	
4325	Acrolein	µg/L	< 5	0.00		Acceptable	EPA 8260B
4340	Acrylonitrile	µg/L	< 5	0.00		Acceptable	EPA 8260B
0065	Benzene	µg/L	20.4	18.9	12.8 - 25.0	Acceptable	EPA 8260B
0060	Bromodichloromethane	µg/L	75.9	70.0	49.6 - 94.5	Acceptable	EPA 8260B
0062	Bromoform	µg/L	< 1	0.00		Acceptable	EPA 8260B
4950	Bromomethane	µg/L	31.8	32.0	12.8 - 51.2	Acceptable	EPA 8260B
4410	2-Butanone (MEK)	µg/L	< 5	0.00		Acceptable	EPA 8260B
5000	tert-Butyl methyl ether (MTBE)	µg/L	< 1	0.00		Acceptable	EPA 8260B
4450	Carbon disulfide	µg/L	< 5	0.00		Acceptable	EPA 8260B
0058	Carbon tetrachloride	µg/L	< 1	0.00		Acceptable	EPA 8260B
0064	Chlorobenzene	µg/L	66.6	63.4	45.7 - 79.4	Acceptable	EPA 8260B
0061	Chlorodibromomethane	µg/L	91.0	85.2	58.4 - 113	Acceptable	EPA 8260B
4485	Chloroethane	µg/L	< 1	0.00		Acceptable	EPA 8260B
4500	2-Chloroethylvinylether	µg/L	< 1	0.00		Acceptable	EPA 8260B
0055	Chloroform	µg/L	48.8	45.9	31.7 - 59.5	Acceptable	EPA 8260B
4960	Chloromethane	µg/L	< 1	0.00		Acceptable	EPA 8260B
4570	1,2-Dibromo-3-chloropropane (DBCP)	µg/L	< 1	0.00		Acceptable	EPA 8260B
4585	1,2-Dibromoethane (EDB)	µg/L	< 1	0.00		Acceptable	EPA 8260B
4595	Dibromomethane	µg/L	< 1	0.00		Acceptable	EPA 8260B
0094	1,2-Dichlorobenzene	µg/L	74.3	70.3	48.8 - 91.2	Acceptable	EPA 8260B
0096	1,3-Dichlorobenzene	µg/L	55.7	52.2	35.2 - 66.6	Acceptable	EPA 8260B
0095	1,4-Dichlorobenzene	µg/L	< 1	0.00		Acceptable	EPA 8260B
4625	Dichlorodifluoromethane (Freon 12)	µg/L	< 1	0.00		Acceptable	EPA 8260B
4630	1,1-Dichloroethane	µg/L	19.2	17.0	11.1 - 23.1	Acceptable	EPA 8260B
0054	1,2-Dichloroethane	µg/L	20.1	17.5	12.1 - 24.0	Acceptable	EPA 8260B
4640	1,1-Dichloroethylene	µg/L	42.8	34.2	17.9 - 49.8	Acceptable	EPA 8260B
4645	cis-1,2-Dichloroethylene	µg/L	24.6	28.8	20.0 - 38.5	Acceptable	EPA 8260B
4700	trans-1,2-Dichloroethylene	µg/L	< 1	0.00		Acceptable	EPA 8260B
4655	1,2-Dichloropropane	µg/L	< 1	0.00		Acceptable	EPA 8260B
4680	cis-1,3-Dichloropropylene	µg/L	18.7	18.7	13.1 - 24.3	Acceptable	EPA 8260B

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Anal. No.	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description
WP Volatiles (cat# 830) (Continued)							
4685	trans-1,3-Dichloropropylene	µg/L	54.1	57.2	36.7 - 77.3	Acceptable	EPA 8260B
0066	Ethylbenzene	µg/L	< 1	0.00		Acceptable	EPA 8260B
4835	Hexachlorobutadiene	µg/L	< 1	0.00		Acceptable	EPA 8260B
4860	2-Hexanone	µg/L	79.2	78.3	39.2 - 114	Acceptable	EPA 8260B
0063	Methylene chloride	µg/L	56.0	52.7	32.2 - 73.7	Acceptable	EPA 8260B
4995	4-Methyl-2-pentanone (MIBK)	µg/L	71.7	67.5	30.2 - 102	Acceptable	EPA 8260B
5005	Naphthalene	µg/L	< 1	0.00		Acceptable	EPA 8260B
5100	Styrene	µg/L	78.9	76.7	48.9 - 105	Acceptable	EPA 8260B
5105	1,1,1,2-Tetrachloroethane	µg/L	< 1	0.00		Acceptable	EPA 8260B
5110	1,1,2,2-Tetrachloroethane	µg/L	29.2	25.7	13.5 - 39.9	Acceptable	EPA 8260B
0059	Tetrachloroethylene	µg/L	55.3	62.2	34.8 - 81.3	Acceptable	EPA 8260B
0067	Toluene	µg/L	< 1	0.00		Acceptable	EPA 8260B
5155	1,2,4-Trichlorobenzene	µg/L	66.9	67.0	13.8 - 82.0	Acceptable	EPA 8260B
0056	1,1,1-Trichloroethane	µg/L	31.6	28.2	17.7 - 37.7	Acceptable	EPA 8260B
5165	1,1,2-Trichloroethane	µg/L	< 1	0.00		Acceptable	EPA 8260B
0057	Trichloroethylene	µg/L	66.3	63.2	40.2 - 82.5	Acceptable	EPA 8260B
5175	Trichlorofluoromethane	µg/L	< 1	0.00		Acceptable	EPA 8260B
5180	1,2,3-Trichloropropane (TCP)	µg/L	< 1	0.00		Acceptable	EPA 8260B
5225	Vinyl acetate	µg/L		0.00		Not Reported	
5235	Vinyl chloride	µg/L	32.0	28.4	11.4 - 45.4	Acceptable	EPA 8260B
5260	Xylenes, total	µg/L	154	150	86.0 - 201	Acceptable	EPA 8260B
WP Chlorinated Acid Herbicides (cat# 829)							
8505	Acifluorfen	µg/L	4.12	4.93	0.875 - 7.34	Acceptable	EPA 8151A
8530	Bentazon	µg/L	6.43	6.29	0.629 - 12.0	Acceptable	EPA 8151A
8540	Chloramben	µg/L	7.32	8.25	0.825 - 12.1	Acceptable	EPA 8151A
8545	2,4-D	µg/L	2.15	2.52	0.252 - 4.35	Acceptable	EPA 8151A
8560	2,4-DB	µg/L	1.86	5.76	0.576 - 11.0	Acceptable	EPA 8151A
8550	Dacthal diacid (DCPA)	µg/L	3.24	4.37	0.437 - 7.90	Acceptable	EPA 8151A
8555	Dalapon	µg/L	2.93	6.74	0.674 - 11.2	Acceptable	EPA 8151A
8595	Dicamba	µg/L	6.43	6.95	0.695 - 10.1	Acceptable	EPA 8151A
8600	3,5-Dichlorobenzoic acid	µg/L	5.57	7.27	1.92 - 10.8	Acceptable	EPA 8151A
8605	Dichlorprop	µg/L	3.82	4.03	0.645 - 6.01	Acceptable	EPA 8151A
8620	Dinoseb	µg/L	4.08	4.35	0.435 - 6.76	Acceptable	EPA 8151A
7775	MCPA	µg/L	< 10	0.00		Acceptable	EPA 8151A
7780	MCPP	µg/L	< 10	0.00		Acceptable	EPA 8151A
6500	4-Nitrophenol	µg/L	< 1	8.53	0.853 - 14.3	Not Acceptable	EPA 8151A
6605	Pentachlorophenol	µg/L	7.47	8.70	0.870 - 13.9	Acceptable	EPA 8151A
8645	Picloram	µg/L	5.88	6.60	0.660 - 11.8	Acceptable	EPA 8151A
8655	2,4,5-T	µg/L	8.46	9.90	1.17 - 14.3	Acceptable	EPA 8151A
8650	2,4,5-TP (Silvex)	µg/L	6.94	7.55	1.15 - 10.9	Acceptable	EPA 8151A